Exploring occupational irritant hand dermatitis amongst healthcare workers in NHS Grampian.

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Exploring Occupational Irritant Hand Dermatitis Amongst Healthcare Workers in NHS Grampian

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A thesis submitted in partial fulfilment of the requirements of the Robert Gordon University for the degree of Doctorate of Professional Practice

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Declaration

I declare that this thesis has been composed solely by myself and that is has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

Signed: Date:

Zoi Papadatou BSc (ATEI of Crete, Greece), MSc (University of Aberdeen, Scotland).

Dedicated to all the people and especially women around the world who are deprived of the opportunity for education.

"No one can take away from you what you put in your own mind"

~Dr Edith Eva Eger~

Abstract

Background

Occupational Irritant Hand Dermatitis (OIHD) is emerging as an important risk caused by or made worse by work. Occupational Irritant Hand Dermatitis can cause significant and long-term health issues and can impact on the individual's employment. Healthcare workers are amongst the occupations with the highest incidence rates of OIHD.

Aims

The principle aim of this Doctorate of Professional Practice (DPP) thesis was to explore OIHD amongst healthcare workers (HCWs) in NHS Grampian. In order to provide a broad overview of the subject matter, this DPP thesis used a three-study approach to explore, appraise and assess OIHD amongst HCWs.

Methods

The three studies made a standalone contribution in an effort to:

i) understand the prevalence and incidence of OIHD on a local and national level by conducting a retrospective review of the available databases,
ii) identify, appraise and synthesise the best available evidence on the effectiveness of interventions to prevent OIHD by conducting a systematic review of the world-wide literature and
iii) collect information on the distribution and determinants of OIHD in a sample of NHS Grampian HCWs by analysing and discussing their views, experiences and perceptions.

Key Findings

Study I: The key findings suggested that the period prevalence of OIHD amongst HCWs in NHS Grampian on a local level increased annually (2010: 1.11%, 2011: 1.34%, 2012: 2.65%, 2013: 1.45%, 2014: 2.40%, 2015: 3.35%) between 2010 and 2015 amongst the commonly accepted high-risk occupational groups.

Study II: The systematic review identified a lack of studies that had evaluated the effectiveness of interventions for the primary prevention of OIHD.

Study III: Skin health and care for NHS Grampian HCWs is a significant part of their day-to-day job. Skin health and care at work is a multifaceted subject consisting of facilitators and inhibitors which can affect the management, treatment and prevention of OIHD.

Conclusions

The findings of this thesis contributed to the body of research and knowledge by identifying and exploring gaps in the literature. It is advised that an educational evidence-based intervention should be developed to prevent OIHD in HCWs within NHS Grampian; this would be in keeping with the current drivers for creating holistically healthier workplaces.

Key Words: Occupational Irritant Hand Dermatitis, Dermatitis, Skin Disease, Occupational Skin Disease, Hands, Healthcare Workers, Wet Work

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Undertaking this DPP project has been the greatest endeavour in my life.

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Outputs

Peer Reviewed Publications

PAPADATOU, Z., COOPER, K., KLEIN, S., MCDUFF, C. and STEINER, M. 2016. Effectiveness of interventions for preventing occupational irritant hand dermatitis: a quantitative systematic review protocol. *The Joanna Brigs Institute Database of Systematic Reviews and Implementation Reports*, 14(10), pp. 72-81. doi: 10.11124/JBISRIR-2016-003159.

PAPADATOU, Z., WILLIAMS, H. and COOPER, K. 2018. Effectiveness of interventions for preventing occupational irritant hand dermatitis: a quantitative systematic review. *The Joanna Briggs Institute Database of Systematic Reviews and Implementation Reports*, 16(6), pp. 1398-1417. doi: 10.11124/JBISRIR-2017-003405.

Poster Presentations

Joanna Briggs Collaboration European Symposium, Aberdeen, May 2017

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Foreword

During the time I was working in NHS Grampian Occupational Health Services as a nurse adviser I took up training to carry out the skin clinics (clinics for HCWs who had skin issues at the workplace). This is when I developed a great interest for skin diseases at the workplace. I observed that skin disease was a significant issue affecting more members of staff than I had originally thought, and particularly the nursing staff. I soon realised that educating and giving tailored advice to my clients about skin care would enable them to not only manage successfully their symptoms but also prevent further exacerbations in the longer term. Most importantly, it became apparent to me that skin care practices would differ across the professions and areas of work due to the different tasks/nature of work, the work environment and the workers' perspectives.

These observations triggered my curiosity and led to the genesis of my idea to explore the extent of skin disease and its determinants at the workplace in order to ascertain how to best prevent it. Above all, asking the workers' opinions and views on how to best look after their skin at work would be the most significant value in the equation. Choosing to do the Doctorate of Professional Practice was the most appropriate research approach as its structure was tailored to both my clinical expertise and the nature of this topic. Moreover, the selection of this research approach has enabled me to integrate the findings of this thesis with local practices and to make a significant contribution within my profession.

Abbreviations

AHP	Allied Health Professionals
BCW	Behaviour Change Wheel
CCT	Controlled Clinical Trials
CDR	Centre for Reviews and Dissemination
COM-B	Capability Opportunity and Motivation Behaviour
COSHH	Control of Substances Hazardous to Health Regulations
DPP	Doctorate for Professional Practice
EODS	European Occupational Diseases Statistics
EU	European Union
HAI	Healthcare Associated Infection
HCWs	Healthcare Workers
HHSWA	Human Health and Social Work Activities
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HSW Act	Health and Safety at Work Act
IIDB	Industrial Injuries Disablement Benefit
ILO	International Labour Organization
IRAS	Integrated Research Application System
JBI	Joanna Briggs Institute
LFS	Labour Force Survey
MRC	Medical Research Council
MRSA	Methicillin-resistant Staphylococcus aureus

NHS	National Health Service
NOSQ	Nordic Occupational Skin Questionnaire
OACD	Occupational Allergic Contact Dermatitis
OCD	Occupational Contact Dermatitis
ODIN	Occupational Disease and Intelligence Network
OIHD	Occupational Irritant Hand Dermatitis
OH	Occupational Health
OHS	Occupational Health Services
OSD	Occupational Skin Disease
OPRA	Occupational Physician Reporting Activity
PPE	Personal Protective Equipment
PwC	PricewaterhouseCoopers
RCT	Randomized Control Trial
RCUK	Research Councils UK
REF	Research Excellence Framework
RIDDOR	Reporting Injuries Diseases and Dangerous Occurrence Regulations
R&D	Research and Development
SEAT	Skin Exposure Assessment Tool
SIGN	Scottish Intercollegiate Guidelines Network
SRRG	School of Health Sciences Research Review Group
TDF	Theoretical Domains Framework
TEWL	Transepidermal Water Loss
THOR	The Health and Occupation Research Network

UK	United Kingdom
UKRI	UK Research and Innovation
WHO	World Health Organization
WRI	Work-Related Ill-Health

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Chapter 1

Introduction

1.1 Introduction to the chapter

This chapter provides an introduction to the thesis of this Doctorate for Professional Practice (DPP) research which focuses on the prevention of Occupational Irritant Hand Dermatitis (OIHD) within the context of healthcare. The chapter commences with an overview of the development of occupational health and discusses well-being at the workplace in terms of the importance and scope of ill-health prevention and promotion of health at work. It defines and then discusses occupational skin diseases and how they impact healthcare workers (HCWs). Attention is paid to aspects of epidemiology, wet work and occupations at risk.

1.2 Occupational Health Aspects

1.2.1 Occupational health development

History records a large tradition of occupational medicine in Europe, as early as 307 BC where Hippocrates observed appalling working conditions and linked colic symptoms with lead poisoning (Oakley 2008). In the 16th century Paracelcus and Agricola studied the occupational problems of miners and smelter workers (Levy 2006). However, Bernardino Ramazzini has generally been accepted as the 'Father of Occupational Medicine' with his invaluable compendium of health hazards of the medieval crafts (Oakley 2008). Occupational health origins in Great Britain lie in the industrial revolution (Kloss 2010). In the 20th century a variety of acts contributed to the development of occupational health services, including Acts of Parliament (i.e. Workmen's Compensation Act 1897) which were passed to give rights to the employees for compensation against the employer (Thornbory and Everton 2018). Medical monitoring by occupational health practitioners was introduced in response to these measures. The paradox was that the principal reasons for the introduction of occupational health services were put in place to protect the employer against legal action and the public against risk, rather than to protect the health and welfare of the employees (Kloss 2010).

In post-war Great Britain during the 1950's, Prime Minister Attlee introduced in the House of Commons the considerations of the government about the future organisation of occupational health (Stewart 1950). The Prime Minister addressed within his cabinet the need for an agreement regarding which authority should be responsible for occupational health. He also suggested that the limited medical resources of the country should be used to the best advantage of the industry for medical man-power (Stewart 1950). Stewart (1950) argued that there were other contributory factors, equally significant, for the development of occupational health; these were:

(i) the close examination of the purpose of an occupational health service at the workplace to ensure the continuous supervision of the health and fitness of the employees,
(ii) continuation of research activities to ensure progress and development of any future service,
(iii) targeted and continuous training of practitioners (including postgraduate education), and
(iv) further development of the current services reflecting the demands of the working population.

Until the mid-twentieth century the term 'occupational health' used to be known as 'industrial medicine' and in 1950 the Joint International Labour Organization (ILO) / World Health Organization (WHO) issued the first definition of Occupational Health which was updated in 1995 (Thornbory and Everton 2018). In 2002, the WHO regional officer to Europe developed guidance for occupational health practitioners and produced 11 key functions for occupational health services as outlined in table 1.1 below which are still followed to this day (WHO Europe 2019).

1.2.2 Occupational health legal aspects

Official reports such as the Dale Report in 1951 and the Porritt Report in 1962 demonstrated the understanding of the need to orientate occupational medicine around the health and well-being of the worker as well as the need to further develop occupational health into two integrated branches:

i) occupational medicine (specialised branch of preventative medicine) and

ii) occupational hygiene (measurement and physical control of the environmental hazards) (Kloss 2010).

Table 1.1 Functions for occupational health services

1.	To identify and assess health risks at work
2.	To put in place surveillance of work environment factors and work practices that affect the employee's health (e.g. sanitary installations, housing, canteens) when these facilities are provided by the employer
3.	To participate in the development of programmes to optimise work practices, test and evaluate health aspects and equipment
4.	To advise on planning and organisation of work, design of workplaces, choice of maintenance of equipment, substances used at work and machinery.
5.	To advise on occupational health, safety, hygiene, ergonomics and protective equipment
6.	To put in place health surveillance of employees in relation to work risks
7.	To promote and adapt the work to the employee
8.	To provide training, information and education in the fields of occupational health hygiene and ergonomics
9.	To promote measures of vocational rehabilitation
10.	To organise first aid training and emergency treatment
11.	To participate in the analysis of occupational –related accidents and diseases.

Adapted from Lie et al. 2002

In 1974 the primary piece of legislation to cover occupational health and safety in the United Kingdom (UK) was developed. The Health and Safety at Work Act 1974 (HSW Act 1974) was '… *An Act to make further provision for securing the health, safety and welfare of persons at work, for protecting others against risks to health or safety in connection with the activities of persons at work, for controlling the keeping and use of dangerous substances, and for controlling certain emissions into the atmosphere; to make further provision with respect to the employment medical advisory service; to amend the law relating to building regulations, and the Building (Scotland) Act 1959; and for connected purposes…*' (The National Archives 2019 pp. 1-2). The introduction of the HSW Act 1974 has contributed significantly to the reduction of work-related injuries in the past 40 years.

In 1978, the Health and Safety Commission (HSC) produced a document titled '*Occupational Health Services – The Way Ahead*', which highlighted the problem of providing services to smaller companies. A few years later, in 1982 the Health and Safety Executive (HSE) published '*Guidelines for Occupational Health Services'* (Kloss 2010). The booklet discussed the functions, staffing and operation of occupational health services. It also provided practical guidelines that took into consideration the fact that each organisation has its own needs (Kloss 2010). The HSE is Great Britain's leading independent regulator with the aim of reducing work-related death, injury and ill-health by providing advice and guidance to businesses and organisations. The HSE also supports research programmes in relation to occupational risks in Great Britain (HSE 2019a). Further, the Control of Substances Hazardous to Health (COSHH) and the Management of Health and Safety at Work Regulations (1999) require that all employers offer appropriate training, information and guidance to employees with regards to substances capable of damaging their health (Palmer, Brown and Hobson 2013).

By law today all employees should have access to occupational health advice. Depending on the size of a company as well as the hazards of the activities involved, occupational health services should be provided either internally or externally (Hobson and Smedley 2018). There are six major areas that occupational health offers advice in, in terms of meeting legal responsibilities. These functions can be statutory (imposed by the law and/or the HSW Act 1974 for example, certain health surveillance) or advisable (in terms of legal responsibilities for example, application of the HSW Act 1974, guidance on equipment at work) and are: 1. Fitness for work, 2. Vocational placement, 3. Return to work after illness, 4. Ill-health retirement, 5. Work-related illness and 6. Control of occupational hazards (Hobson and Smedley 2018).

1.2.3 Health and well-being at the workplace

In 2008, a review of the wider business case for employers who invest in wellness programmes for their staff was commissioned to PricewaterhouseCoopers LLP (PwC), a London-based multinational professional network, by the Health Work and Well-being Executive of the UK government. A plethora of evidence emerged from the PwC LLP report, supporting the positive impact of health and well-being programmes in a variety of different UK-based industries/businesses; manufacturing, financial services, education, construction/engineering, business services, retail and public services including health services (PwC 2008). The PwC report advocated that initiatives such as the HSE, the management of ill-health and the prevention and promotion of health have contributed to a more holistic approach to employees' wellness (PwC 2008). Figure 1.1 illustrates an adapted version of the PwC LLP conceptual model for employee's wellness.

The conceptual model for employee's wellness comprises three key elements:

(i) Health and safety; a governmental initiative based on policy and statutory requirements,

(ii) Management of ill-health; driven by 'reactive interventions' such as occupational health, absence and disability management which includes rehabilitation schemes, long-term management of disability and return to work plans and,

(iii) Prevention and promotion initiatives; regarding the pro-active nature of health and include health promotion activities, interventions, work/life balance, primary care management and time management schemes.

Figure 1.1 Conceptual model for employee's wellness

Adapted from PwC 2008

Evidence supports that by creating workplaces where the health and well-being of the employees is both protected and promoted, their overall physical and mental health is improved (Waddell and Burton 2006). Better understanding of the interface between work and health, as well as the effects of work-related health has been dominating UK governmental policies in the past decades (Georgiou et al. 2009). The science of workplace health resulted in the development of new academic disciplines such as health economics and management studies that enabled investigations about sickness absence reduction and increased productivity (Coats and Max 2005). Further, a plethora of different health promotion models and literature have emerged within the past few decades (Oakley 2008). Table 1.2 below provides an outline of the major health promotion models in the past three decades.

Table 1.2 Health promotion approaches

Health Promotion Approaches	Brief Description
Medical	Lead by healthcare professionals and focuses on incidence and prevention of a disease
Behavioural	Focuses on convening individuals to change health behaviours to their lifestyles
Educational	Provides individuals with sufficient information to enable them to make informed decisions
Empowerment	Led by Ottawa Charter, a long-term, community-based strategy aiming to empower individuals to take control of their lives.
Social Change	Focuses on the wider socio-economic and environmental context
Tannahills' Model (1985)	Particular to Occupational health model. Focuses on three overlapping elements: i) health education, ii) prevention and iii) health protection
Caplan and Holland (1990)	Health promotion is based on the nature of society and the nature of knowledge
Beattie (1991)	Incorporation of health promotion activities within a framework based on the mode of intervention with the focus on the intervention
French (1990)	Used in primary care and orientated in disease management, health education, politics of health and disease prevention.

Adapted from Thornbory and Everton 2018

The Business in the Community, a business–led membership organisation has developed a model that considers health promotion at work taking into consideration the perspectives of both employees and employers. Figure 1.2 below illustrates the Business in the Community health promotion model entitled 'Workwell Model'. According to this model impact of well-being programmes concerning the promotion of physical and psychological health at work, are positively impacting employees' well-being and health, which improves engagement with the workplace and leads to greater productivity (Business in the Community 2011).

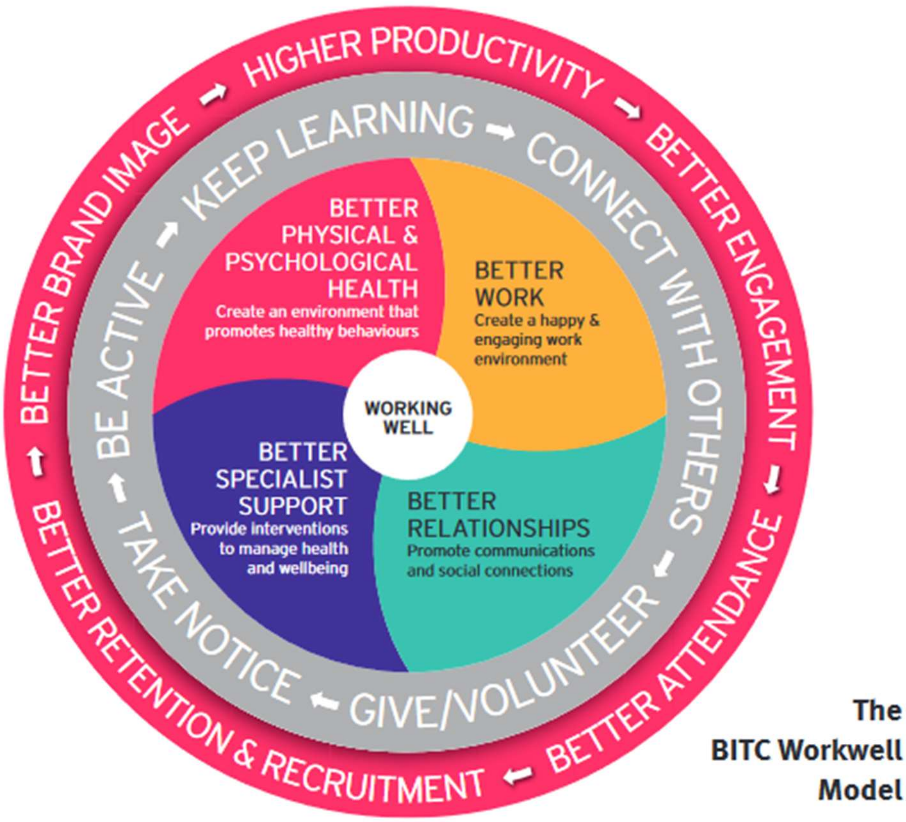


Figure 1.2 Business in the Community Workwell Model by Business in the Community Workwell Model 2011. Reproduced with permission. Source: https://wellbeing.bitc.org.uk/all-resources/research-articles/managing-presenteeism-discussion-paper

This approach can be achieved when employers facilitate: i) healthier physical and psychological work environments, ii) better relationships and iii) better work and when employees commit to: i) connecting with colleagues/management, ii) being active, iii) keep learning, iv) volunteering and v) taking notice (Business in the Community 2011). Equivalent schemes exist across Great Britain. In Scotland, Healthy Working Lives is a scheme that encourages organisations to support employees, improve workplace environments and practices. The scheme offers impartial, good quality health advice to both employees and employers using toolkits and by getting actively involved in health-improving activities (Healthy Working Lives 2018).

Black (2008) urged all businesses/organisations to ensure compliance with health and safety, other relevant employment law and to aim for the reduction of exposure to risk by safety management and prevention. She also acknowledged that the workplace can be a key setting for improving people's health and well-being. Since then, the well-being agenda has become the centre of focus amongst businesses/organisations as well as occupational health providers (NICE 2017). In recent years the promotion of holistic health and well-being in businesses and organisations has become a key aspect in occupational health as well as other organisations (Thornbory and Everton 2018). For example, a UK-based organisation called the 'Well-being Project' is offering training and well-being services to organisations that include auditing, assessments, workshops, webinars, coaching sessions incorporating healthy lifestyles, positive culture, job satisfaction and building strong relationships. The Well-being Project has developed a workplace well-being model as illustrated in figure 1.3 below, which outlines the incorporation of the above.

Holistic well-being has developed to a multifaceted concept consisting of more than the physical or mental health components. Higher levels of an individual's well-being include self-confidence, the quality of relationships, emotions of connection and engagement, self-esteem as well as resilience (Thornbory and Everton 2018). Understanding the impact that health promotion and well-being have at the workplace, underpin the principal aim of the thesis. Exploring OIHD amongst HCWs in NHS Grampian will contribute in creating holistically healthier workplaces which is salient for the employee, the employer and the organisation.

Figure 1.3 The 6 Elements Of Workplace Wellbeing by The Wellbeing Project 2019. Reproduced with permission. Source: www.thewellbeingproject.co.uk

1.2.4 Prevention and early intervention

Whilst health promotion at the workplace is of extreme significance for the employee, the employer and the wider context of community and society, prevention of ill-health and early intervention are equally important. The prevention of work-related injury, death and disease is undoubtedly of extremely high importance from a moral, social and economic perspective (Black 2008). Factors such as better management of health and safety in the workplace, better recognition of the risks and how to control them as well as the decline of heavy industry and manufacturing have contributed to the reduction of fatal and non-fatal injuries in the past decades (Appendices 1.1 and 1.2). Black (2008) acknowledged that all organisations must ensure compliance with health and safety, other relevant employment law and reduction of exposure to risk by safety management and prevention but also urged the workplace to become a key setting for improving people's health and well-being. Occupational health services are regarded as essential and entrusted with preventative functions which are responsible for advising the employer on maintaining a healthy and safe workplace (De Craecker, Roskams and Op De Beeck 2008).

The provision and delivery of occupational health services to the working population is vital for the employees, the employers, the society and the economy of the country. Health promotion as well as ill-health prevention and early intervention are some of the main occupational health services' functions. The focus of this thesis is to explore Occupational Irritant Hand Dermatitis (OIHD) amongst healthcare workers (HCWs) in NHS Grampian. The prevention and management of occupational skin diseases at work and specifically in the health services is of high importance as occupational skin disease is a recognised and significant problem amongst HCWs (HSE 2009). The contribution and involvement of occupational health services (OHS) in relation to the arrangements for prevention and management of such health risks in the National Health Services (NHS) are of major importance in terms of reports of ill-health, data trends, in-house policies and procedures (HSE 2009).

The section that follows reviews the function and significance of human skin and discusses hand hygiene and wet work in relation to HCWs. Later in the chapter occupational skin diseases and their mechanisms of damage will be outlined in order to show the magnitude of the problem and set the context for this thesis.

1.3 Human Skin

1.3.1 Structure – Function- Significance

Skin in humans is the largest integumentary organ. It consists of various layers which have multiple and unique functions such as protection, sensation, temperature regulation, vitamin D production and excretion. As illustrated in figure 4 below, the epidermis (top layer of skin) consists of epithelial tissue.

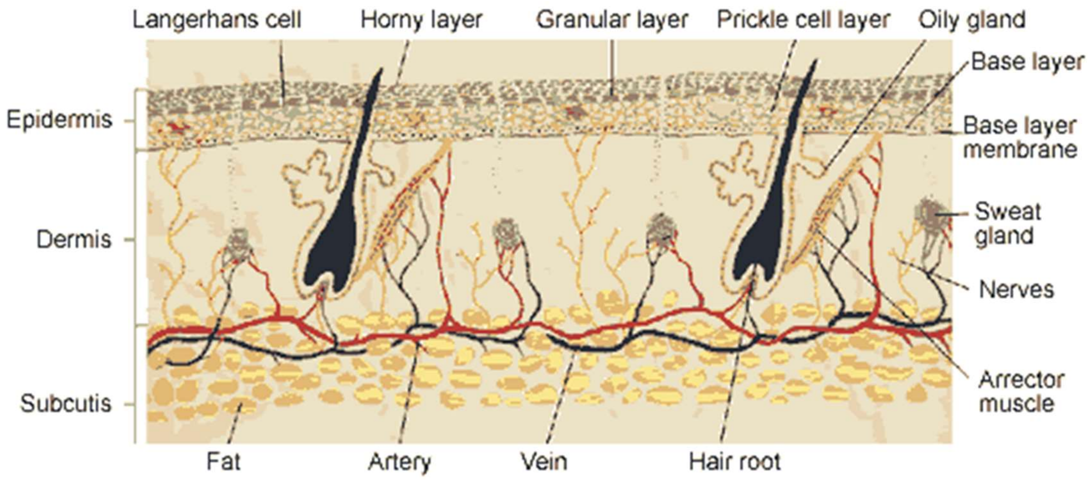


Figure 1.4 Layers of the skin. Source: HSE 2019b. Available online: http://www.hse.gov.uk/skin/professional/causes/structure.htm

This pluristratified epithelium is composed of 10-20 layers of cells (WHO 2009). Epidermis contains Keratinocytes (responsible for keratin production which makes the cells more durable), Melanocytes (skin colour contributors), Langerhans cells (involved in immune responses) and Merkel cells (associated with nerve endings) (Seeley, Stephens and Tate 2008). These layers of cells are divided into five regions or strata; from the deepest to the most superficial the strata are; stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, and stratum corneum (Seeley, Stephens and Tate 2008). The latter stratum is controlled by complex systems of cellular differentiation which makes epidermis a very dynamic structure; however, chemicals contained in material or agents can breach the skin's integrity (WHO 2009). Once the skin's barrier function is perturbed, the stratum corneum is also influenced (overproduction of keratinocytes) in response to the skin breach in order to restore the skin barrier (WHO 2009). The epidermis rests on dermis which is a layer of loose connective tissue consisting of collagen and elastin cells (Chilcott and Price 2008). These cells, provide skin with elasticity and flexibility. Dermis is responsible for the structural strength of skin (Chilcott and Price 2008; Seeley, Stephens and Tate 2008). Beneath the dermis there is another layer which consists of loose connective tissue (adipose tissue) called subcutaneous tissue or hypodermis (Seeley, Stephens and Tate 2008). Adipose tissue is a metabolically dynamic organ, composed by adipocytes and other cells (blood cells, endothelial cells pericytes and adipose precursor cells) (Coelho, Oliveira and Fernandes 2013). The adipose tissue of the subcutis (also known as connective tissue), assists in shock absorption and insulates the underlying tissues, bone, muscle and organs (Chilcott and Price 2008; Seeley, Stephens and Tate 2008). Due to the dynamic multicell composition, adipose tissue is now considered to be an important organ of a complex network responsible for participating in diverse biological functions including immunity (Coelho, Oliveira and Fernandes 2013).

1.3.2 Skin flora

Price (1938) distinguished two types of skin flora by conducting laboratory experiments in which hands were repeatedly scrubbed or immersed in alcohol namely (i) resident or (ii) transient (WHO 2009). Resident flora consists of bacteria which can be isolated from the deeper layers of the stratum corneum, ducts of the hair, and underneath the nails even after prolonged disinfection (Gould 2012). These bacteria are not considered to be pathogenic or weakly pathogenic (Gould 2012). Resident flora has two main protective functions: microbial antagonism and the competition for nutrients in the ecosystem (WHO 2009). In general, resident flora are less likely to be associated with infections, but may cause infections in sterile body cavities, the eyes, or on non-intact skin (WHO 2009). Transient flora is carried on the surface of the skin and consists of bacteria which are acquired by direct contact with the environment (Gould 2012). Transient microorganisms do not usually multiply on the skin, but they survive and multiply on the skin surface (WHO 2009). They are often acquired by HCWs during direct contact with patients or contaminated environmental surfaces adjacent to the patient and are the organisms most frequently associated with healthcare associated infections (HAIs) (WHO 2009). The transmissibility of transient flora depends on the species present, the number of microorganisms on the surface, and the skin moisture (WHO 2009). Hands may become persistently colonised by pathogenic flora such as staphylococcus aureus, Gram-negative bacilli, or yeast (Gould 2012).

1.3.3 Hand hygiene in HCWs

Intact skin on the hands and forearms is a requirement for all HCWs undertaking clinical tasks if patient safety is to be maintained and the risk of HAI to be contained (WHO 2009). The association between hand washing and the spread of disease was established two centuries ago. The father of hand hygiene Ignaz Semmelweiss, observed that hospital-acquired diseases were transmitted through HCWs' hands (Pittet 2004). Semmelweiss introduced a chlorinated lime solution for HCWs to scrub their hands. The result of this intervention was immediate and soon was associated with the reduction of patients' deaths thereafter (Pittet 2004). Jungbauer (2005) outlined Semmelweiss' contribution to the progress and evolution of medical science whilst he showed in his thesis that it can be detrimental to the individual's health when skin disinfection is not applied with good judgement.

A variety of hand hygiene methods and products aimed at HCWs have emerged since then (WHO 2009). Currently, hand antisepsis can be achieved by:

1. Antiseptic hand wash (hand washing with antimicrobial liquid soap) for reducing the level of transient microflora.

2. Antiseptic hand rub (hand rubbing with alcohol-based hand rub) also for the reduction of transient microflora.

3. Surgical hand antisepsis (surgical hand washing with chlorhexidine or povidone-iodine-containing soap or rubbing with alcohol-based hand rub). This type of antisepsis is directed against resident skin flora (WHO 2009).

1.3.4 Wet Work

The HSE defines wet work as: '*…Prolonged or frequent contact with water, particularly in combination with soaps and detergents, can cause dermatitis (e.g. a long time spent washing up or frequent hand washing). 'Wet work' is the term used to describe such tasks in the workplace…'* (HSE 2019c). Wet work is long-lasting (two or more hours per day) or repeated (more than about 20-25 times per day) contact with water. Work tasks where an employee is exposed to wet work during a substantial time at work defined as:

- routinely for two or hours per working day with hands in a wet environment, or
- regularly or intensively have to clean hands (more than 20 times per working day, particularly in combination with soaps and detergents), or

- wearing occlusive gloves, which lead to accumulation of heat and moisture, for a cumulative time of two hours or greater in any 24 hour period (Johansen, Frosch and Lepoittevin 2011).

Where an individual does both, using occlusive gloves and undertaking repeated hand washing or long lasting contact with water, the effect becomes additive (Fartasch et al. 2012). Wet work may have an irritant effect on the skin damaging the natural barrier of the skin, leading to skin damage, ranging from 'dry skin' to severe irritant contact dermatitis with broken skin (e.g. skin fissures) (WHO 2009). This damage can be increased by the use of soaps, detergents and alcohol gel products, which are a necessary part of hand hygiene in HCWs and particularly amongst nurses (Jungbauer 2005; Jungbauer et al. 2004b).

1.4 Occupational Skin Disease

Occupational-related skin problems can cause long term ill-health and have adverse career implications for HCWs (Palmer, Brown and Hobson 2013; Jungbauer 2005). Furthermore, this can impact adversely on the treatment of patients and also cost to the NHS. It is estimated that four million working days are lost every year due to occupational skin disease (Brown 2004). In the 2018 annual report of the HSE regarding work-related skin diseases in Great Britain, the new cases of self-reported skin disease were estimated to be 7,000 and the new cases reported by dermatologists were 891 (HSE 2018a). Information regarding the cost of hospital-based healthcare staff can be found on the available government report of health and social care unit cost, which provides information about the cost of professional staff according to their job title and band (Curtis and Burns 2018). The estimates of ill-health and work-related injuries in Great Britain are calculated on the cost of the individual (e.g. loss of earnings, sickness absence cost, human cost), the employer (e.g. sickness pay, insurance recruitments, retraining) and the society (e.g. medical treatments, loss of output, industry/admin cost, investigation costs from HSE) (Georgiou 2009). The cost estimates of work-related ill-health and workplace injuries, as published by the HSE annually, are used for various reasons such as evaluating measures to reduce accidents at work, inform workplace policies and generating European comparisons (Georgiou 2009). Although the HSE annual report for 2018 did not report specifically the cost associated to skin disease in Great Britain, it advised that in 2016/2017 the annual costs of new cases of work-related ill-health (which included skin diseases and excluded long latency illness such as cancer) was estimated at 9.7 billion pounds (HSE 2018b).

1.4.1 Definitions

Occupational skin disease is defined by the HSE as 'any disorder of the skin which is caused by or made worse by work or any workplace activity' (HSE 2019c). Occupational skin diseases (OSD), also known as occupational dermatoses, are skin diseases primarily caused by exposures in the workplace (HSE 1998).

Dermatitis

Dermatitis is also known as eczema (these two terms are used interchangeably in the literature and in this thesis) is characterised by redness, itching, scaling, rashes, hives, blistering, or fissures of the skin. Dermatitis/Eczema can be endogenous or exogenous. Endogenous dermatitis is caused by genetic factors and may be linked with asthma and hay fever. Individuals with endogenous dermatitis are likely to have had problems with their skin since childhood and may have other affected family members. Exogenous dermatitis is caused by skin damage from external factors such as irritants or allergens. Individuals with endogenous dermatitis tend to be more susceptible to damage from external sources and, as such, the two often coexist. Two common forms of exogenous dermatitis are usually seen in the workplace; contact dermatitis, with two types: allergic and irritant (Johansen, Lepoittevin and Thyssen 2016).

Contact Dermatitis

Contact Dermatitis may be defined as inflammation of the skin resulting from contact with a chemical or physical agent. There are two main types of contact dermatitis:

1. **Allergic contact dermatitis (ACD)** is caused by an immune response following skin contact with an allergenic, or 'sensitising', substance. Skin reactions may not be caused on initial contact and some people will only have an allergic reaction after repeated exposure. Once a person is 'sensitised' to a substance, it is likely

that the reaction becomes permanent and further contact with the substance, even in very small quantities, may result in a reaction (Johansen, Lepoittevin and Thyssen 2016).

2. **Irritant contact dermatitis (ICD)** is the more common form of occupational dermatitis and occurs when something damages the surface of the skin faster than the skin is able to repair. Irritants act directly on the skin through chemical reactions and can be chemical, biological, mechanical or physical (Johansen, Lepoittevin and Thyssen 2016).

Contact Urticaria

Another common occupational skin disease that occurs frequently is contact urticaria. It can be defined as type I immune response (immediate type) that can result in anaphylaxis (Chilcott and Price 2008). Contact Urticaria is a transient immunological response of the skin which typically occurs soon after the exposure to an allergen and may resolve once the exposure ceases (Johansen, Lepoittevin and Thyssen 2016). Contact urticaria is a non-infectious skin disease.

The lack of a standard definition for skin diseases due to the use of different terms (as shown above) is acknowledged amongst the expert communities nationally and internationally (Nicholson et al. 2010). The use of term Occupational Irritant Hand Dermatitis (OIHD) will be used throughout this thesis to describe the most common form (irritant contact dermatitis/eczema) of occupation-related skin diseases affecting HCWs.

1.4.2 Causes

There are four major hazards of dermal exposure that can develop into occupational-skin diseases. Figure 1.5 illustrates these hazards.

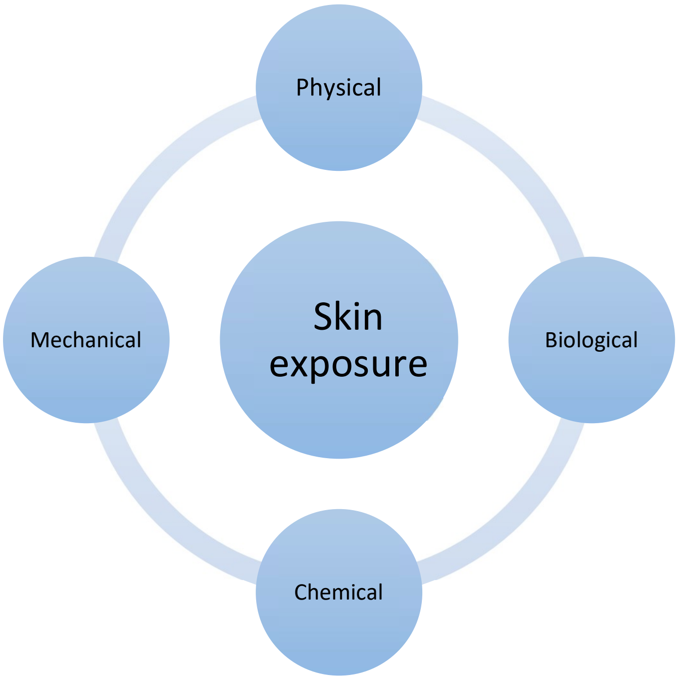


Figure 1.5 Skin Hazards

Physical hazards cause skin damage by exposure to extreme temperatures (both cold and hot) as well as radiation (including solar and ultraviolet).

Biological hazards capable of causing skin disease include exposure to parasites, microorganisms, plants and animals.

Chemical hazards are the most common causes of occupational skin disease. These agents can be divided into two groups, irritants and sensitisers (or allergens) which act directly on the skin though chemical or immunological reactions (HSE 1998). Sensitizers may not cause immediate skin reactions, but repeated exposure can result in allergic reactions (Type I: immediate Hypersensitivity/Anaphylactic Reaction, Type II: Cytotoxic Reaction/Antibody dependent, Type III: Immune Complex Reaction and Type IV: Cell-Mediated/Delayed Hypersensitivity) (Benjamini, Coico and Sunshine 2000). Exposure to chemical agents can occur through:

- direct contact with contaminated surfaces,
- deposition of aerosols,
- immersion, or
- splashes (HSE 1998).

Mechanical trauma is another form of hazard that can cause skin disease through friction, pressure, abrasions, lacerations and contusions (scrapes, bruises, cuts) (De Craecker, Roskams and Op De Beeck 2008).

The effects can be localised (skin irritation, burning or urticaria) or systemic (when the chemical passes from the surface of the skin into the general circulation via the horny layer or the epidermis or dermis) (De Craecker, Roskams and Op De Beeck 2008).

The main causes of OIHD are exposure to wet work, the nature of the substance and the degree, duration and frequency of exposure as well as factors such as under-hydration or over-hydration of the barrier layer of the skin which can determine the susceptibility of the individual (HSE 1998). The signs of OIHD are redness, swelling, blistering, flaking, cracking and itching (HSE 1998). Clinical investigation and diagnosis of occupational skin disease includes medical examination, patch testing, prick testing, blood testing and skin biopsy (HSE 1998). Occupational-related skin diseases are one of the most common ailments currently affecting employees in many countries internationally (Wiencke, Cacace and Fischer 2012; De Craecker, Roskams and Op De Beeck 2008).

1.4.3 Mechanisms of damage

A skin irritant is a non-infective agent, physical, chemical or mechanical, capable of cell damage if applied to the skin for sufficient time and in sufficient concentration, whereas skin sensitisers or allergens are substances capable of causing allergic contact dermatitis (HSE 1998). The underlying mechanism of damage differs from that of the irritant type. The sensitisers penetrate the skin layers and provoke a chain of immunological events which soon after (usually within seven days) cause allergy (HSE 1998). The skin damage can increase the exposed wet worker's vulnerability to sensitisation (development of allergy) by other substances to which they might be exposed in their workplace. In a healthcare setting this can also increase the risk of transferring infections from HCW to patient and vice versa (Jungerbauer 2005; Diepgen 2003).

1.5 Epidemiology of Occupational Skin Disease

1.5.1 International level

The International Labour Organization (ILO) list of occupational diseases has recognised occupational skin diseases including allergic/contact dermatitis and skin cancers, under their criteria for incorporating occupational diseases in the ILO list (ILO 2019). The list of occupational diseases is appended to the ILO code of practice for recording and notification of occupational accidents and diseases (De Craecker, Roskams and Op De Beeck 2008). In protocol ILO 155/2002 the establishment and application of specific procedures for the notification and reporting of occupational skin diseases by employers as well as insurance institutions is proposed (De Craecker, Roskams and Op De Beeck 2008). The ILO also acknowledged the importance of the occupational health services responsibility in the prevention of work-related skin diseases (ILO 2019).

1.5.2 European Level

By law, employers in the European Union (EU) must protect their employees from being exposed to any dangerous substances in the workplace (European Agency for Safety and Health at Work 2019). Employers must carry out risk assessments to determine the severity of the risk/exposure and act on them (European Agency for Safety and Health at Work 2019). Employers are also obliged to provide employees with information and relevant training on substances hazardous to health, however legislation regarding the recognition of occupational diseases can vary due to each country's different disease determinants, laws and regulations (Craecker, Roskams and Op De Beeck 2008). In most of the EU countries the recognition of occupational skin disease passes through the application of the following three criteria: (i) causal relationship between exposure to hazardous substance and disease, (ii) linkage of the exposure to the workplace and (iii) occurrence of the disease amongst groups of people with a frequency that exceeds the average morbidity of the general population (De Craecker, Roskams and Op De Beeck 2008). The European Occupational Diseases Statistics (EODS) collates and presents annually the statistics from each country (De Craecker, Roskams and Op De Beeck 2008). Although no specific schemes or systems exist for the recognition of occupational skin diseases, each country includes skin disease in the national lists of occupational diseases (De Craecker, Roskams and Op De Beeck 2008).

1.5.3 National level

Disease reporting in Great Britain within the statutory requirements of the Reporting of Injuries, Diseases and Dangerous Occurrence Regulations (RIDDOR) is retained by the HSE (HSE 2019a). The recognition of occupational skin disease specifically, is based on an official list. However, the statistics currently available are subject to voluntary schemes (EPIDERM and OPRA) each with different properties. For example, both dermatologists and occupational physicians report on the incidence of occupational skin diseases annually (HSE 2018c). Moreover, data are collated from the annual survey of work-related illness within the Labour Force Survey (LFS) where the general public is self-reporting work-related health issues including skin diseases (HSE 2018d). The strengths and weaknesses of the data sources mentioned above will be further discussed in chapter 4.

Occupational disease registries around the world provide incidence and prevalence data based on the reporting systems of occupational skin diseases that are available in each country (De Craecker, Roskams and Op De Beeck 2008). Due to differences in disease definitions, surveillance data, diagnostic criteria and different reporting systems it has been difficult to define the prevalence of occupational skin diseases whereas the majority of published data concern incidence rates (Rustemeyer et al. 2012; Nicholson et al. 2010). Further, factors such as lack of standardised assessments for diagnosing occupational skin diseases, compulsory or voluntary schemes reporting as well as the perception (in self-reporting cases) of skin disorder as not life-threatening or affecting work attendance have been identified to contribute to the poor quality of epidemiological data (Keegel et al. 2009). These factors can explain the differences that are observed nationally and internationally regarding epidemiological data of occupational skin disease and they may have contributed to under-reporting of occupational skin disease (Cherry et al. 2000).
Incidence rates of occupational skin disease reported through voluntary schemes can be variable and therefore, high-quality data on incidence of occupational skin disease are scarce in the literature which may not represent the true extent of the disease (Keegel et al. 2009; Schlieman and Elsner 2007).

Occupational irritant hand dermatitis has been the most frequently reported condition (Schlieman and Elsner 2007). Understanding the epidemiology of occupational skin disease is extremely significant in order to determine the causal and contributory factors of the disease and to develop effective interventions for its prevention (Diepgen and Coenraads 1999). Consequently, this study aims to generate evidence-based proof in order to inform the development of an effective and safe intervention for the prevention of OIHD.

1.6 Occupations at risk & Impact

1.6.1. Occupations at risk

Several occupations are regarded as being at high-risk of developing occupational skin diseases. In Great Britain the reported occupations with the highest rates of work-related skin disease between 2007 and 2017 were:

-florists (76.7 cases per 100,000 workers per year),
-hairdressers and barbers (67.5 cases per 100,000 workers per year),
-cooks (62.9 cases per 100,000 workers per year),
-beauticians (69.9 cases per 100,000 workers per year), and
-metal working machine operatives (43.7 cases per 100,000 workers per year) (HSE 2018a).

Other occupations with high incidence rates (over 25 new cases per 100,000 workers per year) included dental practitioners, nurses, and moulders (HSE 2018a). Similar occupational sectors (manufacturing, construction, health and social care, beauticians, cooks, cleaners) with high incidence rates of occupational skin disease have also been reported across Europe (Schwensen et al. 2013; De Craecker, Roskams and Op De Beeck 2008) therefore, OIHD in NHS staff is important to explore.

1.6.2 Impact

In 2008 skin diseases were listed as the second most common occupational health problem in Europe (De Craecker, Roskams and Op De Beeck 2008). Work-related skin disease together with respiratory disease accounts for a significant part of the work-related ill-health (WRIH) of Great Britain (Carder et al. 2017). Brown (2004) identified the high prevalence of occupational skin disease in all industries in Great Britain and acknowledged the health impact as well as the economic consequences. The development of OIHD can be attributed to various risk factors such as type of work, frequency of hand washing, length of exposure to substances (contained in soaps or personal protective equipment) that can be harmful for the individual (Elsner 2007). The clinical manifestation of OIHD symptoms can also vary from mild to severe and once the disease is established it has the potential of impacting the individual's quality of life and ability to work (Elsner 2007).

1.7 Summary

The evidence suggests that occupational skin diseases are a significant problem amongst several occupations. High prevalence of occupational skin diseases among HCWs and especially nurses is attributed to wet work and in particular frequent hand washing (WHO 2009). Occupational Irritant Hand Dermatitis causes medical symptoms that can affect the health and well-being of an individual in the long-term. It can also affect work attendance and cost to the NHS in the case of HCWs. Successful prevention of OIHD would ensure long-term benefits for the individual's health and well-being. The consensus of the past two decades puts the workplace in the centre of health promotion, ill-health prevention and holistic well-being of the employee in order to achieve long-term health benefits for the working population that will contribute to a stronger society and economy.

Occupational Irritant Hand Dermatitis is a significant issue amongst wet workers; therefore, exploring methods to prevent it is of the utmost importance. Hence, the main focus of this thesis is to elicit information from the NHS Grampian occupational health service and to explore OIHD amongst HCWs, in order to inform the development of an evidence-based intervention for the prevention of OIHD. The next chapter will provide the findings of a review of the literature that was conducted in order to explore in greater depth the available evidence on OIHD specifically on disease recognition, its epidemiology and prevention.

Chapter 2

Literature Review

2.1 Introduction to the chapter

This narrative review aims to identify and synthesise the pertinent published literature regarding work-related skin disease and its prevention. Developing an understanding of preventative strategies and identifying the gaps in the scientific literature will underpin the rationale and significance of conducting this research.

2.2 Background

As described in chapter 1, occupational skin diseases are amongst the most important emerging risks affecting wet workers across different professions such as HCWs, beauticians, florists, metal workers, machine operatives, and workers in the food and cooking industries. Work-related skin disease can cause long-term ill-health and have adverse effects on the individual’s health and employment. The severe impact of work-related skin diseases also affects organisations by increasing their costs from lost working days, employees’ retraining and poor employment prospects once the wet workers lose their job (Schliemann and Elsner 2007).

As stipulated in Black’s (2008) review of the health of Britain’s working age population the health and well-being of the individuals impacts beyond themselves, affecting their families, workplaces and wider communities. Black (2008) advises that by identifying factors that prevent good health and by eliciting interventions (including change in attitudes, behaviours and practices) to address these factors, health in relation to working life will improve.

Developing an understanding of the recognition and effective prevention of occupational skin diseases is of significant interest to researchers, clinicians as well as health and safety agencies. The aim of this narrative review is to provide an overview of the current literature in relation to this project’s aim and research questions.

2.3 Method

2.3.1 Narrative reviews

A narrative review typically aims to demonstrate that the writer has extensively researched published literature on a topic and critically evaluated its quality (Ferrari 2015). It can cover a wide range of subjects at various levels of comprehensiveness and completeness (Green, Johnson and Adams 2001). This method of reviewing the literature seeks to identify omissions or gaps in what has been accomplished previously, or lack of consensus about a topic or to place the information into perspective (Ferrari 2015; Day 1998). Narrative reviews usually lack intention to maximize the scope of literature and/or analyse the data collected leaving conclusions open to bias (Grant and Booth 2009). It is, therefore, extremely important for the authors to provide a clear and succinct summary of their findings and draw conclusions from the papers they reviewed in order to minimise bias (Grant and Booth 2009).

2.3.2 Literature searching

In order to provide an overview of the literature regarding the prevention of OIHD a preliminary and broad search of the literature took place. Electronic searching took place by using the following databases: Allied and Complementary Medicine (AMED), Cumulative Index of Nursing and Allied Health Literature (CINAHL), Science Direct, Scopus, The Knowledge Network (specifically searched within the library section), Robert Gordon University's thesis database OPEN AIR, EthOS e-thesis and Web of Science.

Key terms were separated with Boolean Operators 'AND' (to narrow the search) and 'OR' (to broaden the search) and truncated when appropriate by using the asterisk symbol (*) (Smith and Noble 2015). In this way, the Boolean logic of using these operators allowed the researcher to link the search terms in specific ways. The key word searches included: occupational AND dermatitis OR eczema, occupational skin disease* AND prevention*. All study designs between January 1998 and December 2014 were included; quantitative, qualitative, systematic reviews and mixed methods, as well as reports and theses in the English language. Moreover, the inclusion criteria that guided this search concerned wet workers of working age (16 to 70) with OSD caused or made worse by work. A total of 10 papers met the above inclusion criteria (tables 2.1-5) and included: three quantitative systematic reviews, one report, four quantitative studies (three RCTs and one randomized intervention study with a control group) and two epidemiological studies (cohort). The main themes the papers concerned were the prevention and treatment of occupational skin disease amongst different wet work occupations and the effectiveness of interventions to prevent skin disease. The articles were then categorised into study types and based on their findings groups of wet work occupations were identified (hairdressers, cleaners and kitchen workers, industrial workers such as metal, dye and print workers and HCWs). Further hand-searching took place of the reference list of each article identified in order to find additional eligible articles relating to the wet work groups that may have not been indexed by the use of key terms. The following section provides an overview of the papers that were reviewed.

2.4 Critical appraisal of the literature

Systematic Reviews

Three quantitative systematic reviews were identified regarding the following topics; management of occupational dermatitis in HCWs (Smedley et al. 2011), the treatment and prevention of contact dermatitis amongst healthcare workers, hairdressers and healthy populations (Saary et al. 2005) and interventions for preventing OIHD amongst different occupations (metal workers, cleaners and kitchen workers, hairdressers and print and dye workers) (Bauer et al. 2010). A MeaSurement Tool to Assess systematic Reviews (AMSTAR 2) was used (appendix 2.1) to appraise the three systematic reviews as it was deemed most suitable. AMSTAR 2, which is a modified version of the original AMSTAR, is one of the most widely used tools for critical appraisal of systematic reviews that specifically include randomised or non-randomised studies of healthcare interventions (Shea et al. 2017). All three systematic reviews were high quality reviews as their results had either no or one non-critical weakness according to the AMSTAR 2 tool which aspires confidence in the findings. The authors in all three systematic reviews used a comprehensive literature search strategy. The aims and objectives as well as the methods were discussed appropriately and with clarity. A minimum of two independent reviewers agreed on the selection of eligible studies and all three reviews used satisfactory techniques for assessing the risk of bias in the individual studies included in the reviews. The section below discusses briefly the key points and main limitations of each systematic review.

Smedley et al. (2011) conducted a systematic review of 11 papers out of the 1677 papers initially identified (after deduplication) that met the review's inclusion criteria. The review was concerned with the management of occupational dermatitis particularly in HCWs. Table 2.1 outlines the objectives, methods and main findings/recommendations of the review. This review informed the development of an evidence-based guideline using the Scottish Intercollegiate Guideline Network (SIGN) methodology. The SIGN methodology is a robust tool, specific to clinical practice using evidence-based guidelines designed to assimilate, evaluate and synthesise evidence on best current practice (SIGN 2011). The SIGN critical appraisal checklist is a reliable tool based on criteria designed to ensure methodological rigour and minimise research bias (SIGN 2011).

Bauer et al. (2010) conducted a systematic review of various databases (Cochrane Skin Group Specialised Register, Cochrane Central Register of Controlled Trials in Cochrane Library, MEDLINE and EMBASE) in order to assess the effectiveness of interventions for preventing OIHD in wet work occupations. Four RCTs were identified and met the review's inclusion criteria. The studies included primary prevention studies; studies where participants with existing OIHD were not included, unless data from mixed populations (with or without pre-existing OIHD) could be extracted and analysed separately. The overall review produced positive findings in respect of primary prevention of OIHD. The effective primary prevention interventions were the following: i) barrier creams versus no intervention, ii) emollient or barrier cream compared to no intervention intervention, iii) moisturiser versus no intervention and iv) barrier cream containing aluminium chlorohydrate versus barrier cream without aluminium chlorohydrate. However, trials on primary prevention of OIHD with null or negative findings may have been missed in the review process (publication bias). Only a limited number of RCTs was identified in the review, and the majority of studies showed methodological weaknesses (e.g. clinical diagnosis of OIHD). The authors concluded that due to the lack of statistical significance in the review, there is a need for further and broader studies to determine if primary prevention is effective and if so, which would be the best preventive measure (Bauer et al. 2010).

Saary et al. (2005) searched multiple databases (MEDLINE, EMBASE and Cochrane) to assess the prevention and treatment of contact dermatitis. The criteria used for rating the identified studies were based on the U.S. Preventive Services Task Force guidelines, a robust tool supported by the Agency for

Healthcare Research and Quality specific to preventive evidence (Harris et al. 2001). The U.S. Preventive Service Task Force framework uses explicit criteria and general guidelines to assign one of three grades; good, fair or poor. Good or fair quality evidence contain studies where findings are generalisable specifically to the primary care population, have sufficient designs and quality to provide evidence-based associations and integrate prevention with health outcomes (Harris et al. 2001). A total of 49 studies met the inclusion criteria out of which 28 studies met the eligibility criteria ('good' or 'fair') as 21 studies were rated as 'poor' and were not included in the results. Wet work occupations such as HCWs, hairdressers as well as healthy volunteers were included in the review. Although a limited number of interventions was found to effectively prevent or treat allergic and/or irritant dermatitis, the lack of outcome-blinded studies was noted. For the prevention of irritant contact dermatitis moisturisers, barrier creams and the use of softened fabrics were effective in preventing the development of dermatitis (Saary et al. 2005). As for the treatment of irritant contact dermatitis the evidence showed that lipid-rich moisturisers were effective in the short-term treatment. There were also four good quality studies that evaluated the effectiveness of steroids for allergic contact dermatitis (Saary et al. 2005).

All three systematic reviews identified similar high-risk wet work occupations for the development of occupational skin disease. These were hairdressers, metal workers, print and dye industry workers and HCWs. The findings of the systematic reviews discussed above verified that there are gaps in the literature and research regarding the prevention of occupational skin disease, due to both the heterogeneity of interventions (e.g. educational strategies, use of moisturiser creams, reduction of hand washing, refraining from work) and populations (having or not OIHD previously) used in the studies. Moreover, the lack of validated scoring systems and criteria for diagnosing OIHD has been identified as a significant factor to be taken into consideration in future research.

Table 2.1 Systematic Reviews

Systematic Reviews				
Authors & Year of publication	**Review aim/objectives**	**Search terms**	**Literature inclusion dates**	**Key findings**
Smedley et al., 2011	To inform evidence-based guidelines for the management of occupational dermatitis in healthcare workers.	Systematic review carried out by multi-disciplinary guideline development group comprising of occupational health professionals (dermatologist, general practitioners and representatives for patients, employers, employees and the Health and Safety Executive) (UK's enforcing agency). Group of experts generated a set of five questions after an initial scoping literature review. Key words derived from these questions and were used in the literature searches. Papers identified formed the basis for guideline recommendations.	1950-2008 1980-2008 1981-2008 (dates not specified)	Eleven papers were included which met the critical appraisal criteria based on the Scottish Intercollegiate Guidelines Network (SIGN). Five key findings emerged: 1. HCWs should seek early treatment for dermatitis. 2. In severe cases of acute dermatitis work adjustments should be applied. 3. HCWs with dermatitis should follow a particular skin programme (for hand hygiene and hand care). 4. The risk of HCWs transferring infection to patients should be further investigated. Findings on the extent of health surveillance effectiveness in reducing dermatitis remains inconclusive.
Bauer et al., 2010	To assess the effect of interventions for preventing OIHD in healthy people who work in occupations	Search terms extensively discussed in the search strategy of the review (appendices 1-4).	2003-2010	Four published Randomised Controlled Trails (RCTs) involving 894 participants were included in this review. The occupations of the participants varied. One study included print and dye workers, the second metal workers, the third

	where skin damage risk is high	Occupational and hand dermatitis, hand eczema and primary prevention.		cleaners and kitchen workers, and the fourth hairdressers. The follow-up period in all four studies varied from 4 to 12 weeks. The review findings reported that: The use of barrier creams and emollients had positive effects in metal workers, print and dye industry workers. No harmful effects or any problems with the efficacy of glove use were identified. Short term benefit from using moisturisers was also noticed albeit without statistical significance, amongst hairdressers, cleaners and kitchen workers. No harmful effects were identified, and no RCTs identified any problems with the efficacy of glove use.
Saary et al., 2005	To provide the Workplace Safety and Insurance Board (WSIB) with evidence-based recommendations regarding treatment decisions for Occupational Contact Dermatitis (OCD).	Contact dermatitis (CD), contact allergy, eczema, controlled study, clinical trial and treatment.	January 1966 to June 2003	A total of 49 studies met the inclusion criteria, however 21 studies were deemed of poor quality and therefore were not included in the results. Prevention: -Barrier creams containing dimethicone or perfluoropolyethers, cotton liners, and softened fabrics prevented irritant CD. Lipid-rich moisturizers both prevented and treated irritant CD. -Topical skin protectant and quaternium 18 bentonite (organoclay) prevented dermatitis. Diethylenetriamine pentaacetic acid (chelator) cream prevents nickel, chrome, and copper dermatitis. -Moisturiser and barrier creams as well fabric softeners (use of towels treated with fabric

				softeners) were effective in preventing the development of irritant contact dermatitis. -No studies investigating the educational strategies for preventing contact dermatitis met the criteria of the review recommending the need of further research to evaluate educational interventions as preventative strategies. -Two of the studies using educational interventions concerned healthcare workers (nursing home workers and auxiliary nurses). -Use of occlusive rubber gloves worsened the symptoms when compared to use of cotton liner gloves alone. Treatment: - Potent or moderately potent steroids effectively treated allergic CD. -Clinical and non-clinical outcomes were improved in both control and intervention groups when corticosteroid creams were used in combination with barrier creams. -No studies were identified to examine whether any treatment improves quality of life and return to work in contact dermatitis.

Report

Williams (2009) undertook a two-year research project as part of his Doctor of Medicine degree. The report being discussed in this section was part of the research project and was submitted to the British Occupational Health and Research Foundation that supported Williams' research project. Williams' (2009) report concerned occupational contact dermatitis with regards to exploring outcomes, prognostic factors and assessments. The report focused on the following four areas which are further outlined in table 2.2:

1. Skin watch: long-term follow-up study of patients diagnosed with occupational contact dermatitis

2. Short-term follow-up study of patients, assessed 4-6 months after initial diagnosis (as it was difficult to trace patients in the long-term follow-up study)

3. Hand washing study: study to assess the number of times people wash their hands daily, using a validated question from the Skin Exposure Assessment Tool (SEAT)

4. Hand surveillance in the workplace: this study investigated exposures to wet work, powdered latex gloves and uncured epoxy resin in four different work groups: HCWs, hairdressers, food handlers and epoxy resin handlers

Table 2.2 Report

Report			
Authors & Year of publication	**Report aim**	**Methods**	**Key outcomes**
Williams, 2009	To undertake a two-year research for occupational contact dermatitis regarding outcomes, prognostic factors and assessment	Research was undertaken in four different areas: 1. **Skin watch**: long-term follow-up study of patients diagnosed with occupational contact dermatitis 2. **Short-term follow-up study**: took place as it was difficult tracing patients in the long-term follow-up study. Patients were assessed 4-6 months after initial diagnosis 3. **Hand washing study**: took place to assess the number of times people wash their hands during a day using a validate question from the skin exposure assessment tool (SEAT) 4. **Hand surveillance in the workplace:** This study investigated exposures to wet work, powdered latex gloves and uncured epoxy resin in four different work groups: healthcare workers, hairdresser, food handlers and epoxy resin handlers	**1. Skin watch:** 225 people reassessed and 123 assessed in person. Development of a skin assessment tool (SEAT). Development of an occupational contact dermatitis algorithm. Data supports findings from previous studies. 24& clear and 42%clear with occasional flare up at follow-up. Worker outcomes described in Occupational Contact Dermatitis Outcome Algorithm scores. Identification of 21 cases of Persistent Post Occupational Dermatitis. Data collection on psychological impact of Occupational Contact Dermatitis. **2. Short-term follow-up study:** 63 patients assessed (over 69% patients were contacted). Short-term prognosis appears better than seen in skin watch. Identification of some patients who have already failed to improve (24%). 10% did not follow treatment advice. 20% did not follow avoidance advice. 6% failed to use appropriate Personal Protective Equipment. Highlights the importance of a review in clinical cases of Occupational Contact Dermatitis, where there is lack of improvement. **3. Hand washing study:** Data of 54 patients were collected.

			Average mean of hand washing during a day was 12. Significant correlation between recorded hand washing and each of the three-day assessments and the average. Females washed their hands more than males. Patients with hand eczema washed their hands less than those with no hand eczema. Validation of the question 'How many times do you wash your hands during a day?'. **4. Hand surveillance in the workplace:** Data of 200 workers were collected. Data collected using modified SEAT questions. Hairdressers inappropriately wore latex gloves (usually powdered). In most circumstances healthcare workers wore appropriate non powdered latex or nitrile gloves. Two cases wore vinyl gloves which is inappropriate as it provides suboptimal protection from blood borne pathogens. Epoxy resin workers often wore gloves which did not offer sufficient protection from epoxy resins. Food handlers, hairdressers and healthcare workers washed their hands many times during a working day and often more than the national and international guidelines. Use of moisturisers was suboptimal amongst wet workers, suggesting the need for a comprehensive skincare programme in workplaces. **5. Other key outcomes:** 15 publications in peer reviewed journals 14 oral presentations at international meetings 5 poster presentation at international meetings

The report provided evidence regarding the multifaceted nature of occupational skin disease and in particular contact dermatitis. Williams (2009) explored the prognosis of occupational contact dermatitis. Poor prognosis was reported in the studies he found contradicting older studies (Wall and Gebauer 1991 cited in Williams 2009; Holness 1995; Burrows 1972) that reported predictive factors of contact dermatitis such as atopy, age and length of exposure. Moreover, Williams (2009) developed the SEAT in order to aid the investigation of occupational and non-occupational dermatitis. Although the SEAT was validated in his third study (hand washing study) its aim was limited in only answering the question 'how many times do you wash your hands during a day'. Moreover, the accuracy of the answers to the question was not studied. Limited information was also provided as to whether hand washing was a risk factor for work-related skin disease (Williams 2009). Further, no information was available regarding the participants' occupational background, type or length of exposure at work-related hazards and any pre-existing skin conditions which can be contributory factors for developing occupational skin disease. The SEAT was then modified and simplified to assess hazards in the workplace amongst HCWs, hairdressers, food handlers and epoxy resin handlers. No specific information as to how the SEAT was modified was discussed therefore, the validity of the questionnaire could not be determined (Boynton and Greenhalgh 2004). The pilot study provided evidence to support the development of educational programmes at a national level regarding the prevention of occupational skin diseases. However, any future approaches would require further validation of the questions that concerned the risks associated with occupational skin disease.

Randomized Controlled Trials (RCTs)

Three RCT's sought to determine the effectiveness of interventions in order to prevent occupational skin disease using different methods and populations (gut cleaners in swine slaughterhouses, metal workers and HCWs) as discussed below. The studies were conducted in Denmark, Germany and the Netherlands respectively.

Flyvholm et al. (2005) conducted a randomized controlled intervention study with a one year follow-up to eliminate seasonal variations. The intervention consisted of an evidence-based programme with educational activities giving recommendations for work-related skin problems prevention which was accompanied by a documented method for assisting its implementation. The prevention programme consisted of recommendations aimed at the management regarding the employees' work routines. Data was collected by telephone interviews using a standardised questionnaire to evaluate the effect of the intervention. The standardised questionnaire used in the study was based on the Nordic Occupational Skin Questionnaire (NOSQ-2002), a validated and widely used questionnaire for screening and monitoring occupational skin diseases, and was modified with some additional questions on exposure, preventive measures, information and discussions regarding the prevention of skin diseases (Flyvholm et al. 2005). Although modifications in standardised questionnaires may affect their validity and reliability, in Flyvholm et al. (2005) study the modifications did not alter the core epidemiological questions of the NOSQ-2002 in any way (Susitaival et al. 2003). A significant reduction of occupational eczema among Danish gut cleaners in 18 swine slaughterhouses was observed (table 2.3). Furthermore, this study confirmed the feasibility of implementing the prevention programme used in the intervention. Another important conclusion that emerged from the findings of the study was that the eczema frequency reduced, while the participants did not refrain from wet work. Such a finding indicates that an educational type of intervention was effective in reducing occupational skin problems without the need of a more drastic intervention such as refrain from wet work, which can impact both the employee and the employer (Palmer, Brown and Hobson 2013).

There were two main limitations in this study. Firstly, the use of questionnaires alone to assess eczema frequency without any concurrent medical examination. This might have impacted on the true prevalence of the eczema by underestimation. Susitaival et al. (2003) argued that although medical examination for eczema diagnosis is the gold standard, using a validated questionnaire such as the NOSQ-2002, is a sound method due to its sensitivity (ability to detect the ill) and specificity (ability to detect the healthy). The second limitation of this study was the fact that the study group was high risk for hand eczema, therefore, similar reduction might not be achievable in other groups and/or industries. The authors do not state or discuss in their paper generalisability.

Kutting et al. (2010) carried out a prospective four-arm (skin care, skin protection, both combined and control group) intervention study which had a one-year follow up. The aim of the study was to assess the effectiveness of the recommended skin protection regimens, in preventing occupational hand eczema among metal workers. A total of 1020 metal workers out of 1355, were recruited in the study. Both hands of the participants were examined by three physicians who underwent training to use a quantitative skin score in order to achieve largely objective and observant-independent results (Kutting et al. 2010). The examinations took part on three occasions, at randomization, after 6 and after 12 months. One of the main limitations of the study was the change of the objective skin score from baseline to 12 months. However, both quantitative (skin scoring) and qualitative methods (personal interviews) were used to collect data which enhanced the pragmatic approach of assessing the effectiveness of the intervention. The study recruited participants from large, medium and small-sized enterprises and showed that the participants from the smaller factories (less than 20 workers) had increased tendency towards skin deterioration compared to the participants from larger factories, but in total, the correlation between sample size and development of skin condition was weak. Lack of industrial standards and safety homogeneity implied that the results from the smaller factories might not be applicable to larger factories. The authors concluded that the recommended skin protection regimen was beneficial despite the low adherence.

Van der Meer et al. (2014) conducted a RCT to investigate the effects of a multifaceted implementation strategy on behavioural determinants (attitude, social influence, self-efficacy and intention to protect the hands) in relation to the prevention of hand eczema among HCWs. The intervention consisted of an education programme regarding the risk of hand eczema at work and a team of role models who received training to become role models for their colleagues in the intervention group. In total, 1649 participants were included at baseline, a total of 1187 responded to the questionnaire in the three-month follow-up while a total of 1078 responded to the third questionnaire at six months after baseline. One of the key findings of the study was that the intervention was effective for behaviour but not for behavioural determinants. The justification the authors provided regarding this finding was that the participants’ intention to perform the behaviour at baseline was high (van der Meer 2014). Another key finding of the study was the incorporation of a participatory group to act as role models for their colleagues and reduce barriers for implementation. Barriers for implementation were defined as following:

i) The participants' awareness of hand eczema,
ii) The receipt of information regarding hand eczema, and
iii) The knowledge the participants had about hand eczema.

No effect on social influence associated with the role models was reported, however, the authors argued that role models may have influenced other factors that were not measured in the study. For example, the role models may have not fulfilled their roles.

In order to measure the HCWs behaviours a modified version of the NOSQ-2002 was used. The authors described in detail and justified the modifications of the NOSQ-2002 in their paper. All the modifications were additions to the original questions therefore, the validity and reliability of the original questionnaire was not compromised. The modifications were made so that the questions were in accordance with the specific work environments of the HCWs (van der Meer 2014). Another limitation of the study that may have introduced bias was the use of self-reported questionnaires to measure behaviour. It was possible that by self-reporting their behaviours the participants may have developed an awareness of the goal of the study. Increased non-response rate (20%) in the follow-up measurement (6 months) may have also introduced bias in the study results. Van der Meer et al. (2014) attributed the non-response rate to the possibility that participants with lower educational level tend to respond less to questionnaires compared with people who have a higher educational level. A final limitation that was reported in the study was the restricted use of questions (two questions per determinant) in the behavioural model. Van der Meer et al. (2014), questioned whether finding no effects on the model's behavioural determinants was due to the small number of questions measuring each determinant.

The approach of combining a participatory strategy along with an education program achieved a behavioural change in relation to using preventative measures. A similar outcome was achieved in Flyvholm et al. (2005) study amongst slaughterhouse gut cleaners.

Table 2.3 Randomized Controlled Trials

Randomized Controlled Trials					
Authors & Year of publication	**Methods**	**Intervention(s)**	**Population/Sample**	**Time Frame**	**Key findings/ Effectiveness of interventions**
Flyvholm et al. 2005	Randomized controlled intervention study with a one-year follow-up.	Educational activities and prevention strategy which consisted of evidence-based recommendations. Telephone interviews and questionnaires based on the Nordic Occupational Skin Questionnaire (NOSQ-2002) at baseline and after one year.	n=736 in 2002 n=748 in 2003 Danish gut cleaners from 18 swine slaughterhouses A total of 644 (87.5%) responded at the baseline interview and 622 (71.6%) at the one year follow up interview. A total of 495 participated in both interviews (67.3%).	2002-2003	In the intervention departments, the frequency of eczema on hands or forearms within three months from baseline was reduced significantly from 56.2% at baseline to 41.0% at follow-up, while a slight non-significant increase was observed in the comparison departments (from 45.9% to 50.2%). The intervention activities resulted in more frequent use of protective gloves in general and the use of cotton gloves worn underneath rubber and plastic gloves. At follow-up three times as many in the intervention departments used the recommended high fat skin care products introduced as part of the intervention activities. At follow-up, discussion of skin problems was increased in the intervention group while no changes were observed in the comparison group.
Kutting et al. 2010	Prospective randomized controlled trial over a follow-up period of 1 year	Four-arm prospective intervention: 1. skin care (use of skin protection and skin care), 2. skin protection (use of skin protection creams before or	n=1,020 metal workers from 19 German factories of small (less than 20 workers) and medium (no number provided) size took part in the study. At 6 months n=797 were examined and at the 12-	Winter 2006/2007 to spring 2008	Key Findings: 1. The use of barrier creams is more effective than using moisturisers alone. 2. The recommended skin protection regimen was effective in preventing occupational skin disease.

		during work and complete avoidance of post-exposure skin care), 3. both 1 and 2 combined and 4. control group (no recommendations offered in this group for either skin protection or skin care). Clinical examination (at randomization, after 6 months and after 12 months).	month follow-up, n=800 participants were included.		3. Improvement of compliance with a skin protection regimen could be enhanced. 4. Significant deterioration of symptoms was found among the control group. 5. The largest improvement was measured in the group following the generally recommended skin protection (skin care and skin protection) followed by the skin protection alone as second best. This study was funded by the German Statutory Accident Insurance (DGUV), one of the largest and oldest social insurance bodies in Germany.
Van der Meer et al. 2014	Randomized Controlled Trial	Intervention: Multifaceted implementation strategy which included: A leaflet containing the recommendations derived from the Netherlands Society of Occupational Medicine (NVAB) guideline to prevent and reduce hand eczema. Intervention Group: Guided by a trained occupational nurse and received training to become 'Dermacoaches' for their colleagues in order to stimulate and motivate their colleagues regarding risk	48 departments were randomly allocated to the multifaceted implementation strategy or the control group. Data were collected at baseline with a 3 and 6-month follow-up. A total n=1649 was included out of the 2597 that were initially invited. A total of 1187 participants responded to the second questionnaire after 3 months and a total of 1078 responded to the third questionnaire after 6 months.	April 2011 to May 2012	The study focused on four recommendations: 1. the use of disinfectant instead of hand washing, 2. the use of moisturisers, 3. the use of gloves when doing wet work and 4. the use of cotton gloves underneath the rubber gloves. An overall compliance was achieved in all four recommendations of the study; however, an effect was shown in three of the recommendations; knowledge, awareness and behaviour related to the prevention of hand eczema but not the behavioural determinants.

		behaviour (that can lead to hand eczema) during work. Control Group: Workers in this group received minimal implementation strategy consisting of the same leaflet as the intervention group.			The study concluded that the multifaceted implementation strategy can be used in healthcare settings to enhance the implementation of the recommendation for hand eczema prevention.

Randomized controlled intervention study with a control group

Dulon et al. (2009) conducted a randomized controlled intervention study with a one-year follow up amongst clinical staff of nursing homes in North Germany. The aim of the study was to determine whether a skin care programme reduces skin disease and increases the protective behaviour and the use of skin care products at the workplace. A total of 388 nurses participated in the study (Intervention Group n=146, Control Group n=242). The nurses completed questionnaires and underwent clinical examinations of their hands by occupational physicians at both the baseline and one year after the intervention. The clinical examinations were not blinded as the occupational physicians performing the examinations were working in the nursing homes therefore, the treatment allocation could not have been concealed from them. Although clinical examination is the gold standard for diagnosis, lack of blinding can introduce bias in the results (Shamout and Adisesh 2016). For example, over or under estimation of the difference between treatments can occur as well as participation/response rates can be affected (Altman and Bland 1999). However, measures for quality assurance were reported in the study that concerned hand eczema assessment; a standardised scoring system validated in previous studies was used and the occupational physicians as well as the instructors had undertaken a one-day training (Dulon et al. 2009).

The study acknowledged the effects on behaviour (use of protective gloves, moisturisers, disinfectants, supply of cotton gloves, and being familiar with the skin guidelines) in the intervention group as the participants increased the use of moisturisers and hand disinfection instead of hand washing. Dulon et al. (2009) concluded that the effectiveness of the skin care programme should include both the training of the nurses as well as management from an occupational advisory service. This study was able to assess the extent the recommendations that were implemented by the nurses at the 3 and 12-month period after the training despite the fact that the sample size was small and that the study did not intend to evaluate the impact of the intervention activities on the workplace (Dulon et al. 2009).

Table 2.4 Randomized intervention study with a control group

Randomized intervention study with a control group					
Authors & Year of publication	**Methods**	**Intervention(s)**	**Population/Sample**	**Time Frame**	**Key findings**
Dulon et al. 2009	Randomized intervention study with a control group	Skin care programme (seminar and training course for skin protection measures). Questionnaires and clinical examinations of hands took place for both groups at baseline and after 12 months. The intervention consisted of the following elements: i)an initial meeting for senior managers providing information regarding risk factors of hand eczema and occupational skin protection measures ii)advisory service training (nurse manager and staff nurses, iii)educational training programme for the nurses regarding skin protection with focus on risk factors and symptoms of irritant contact dermatitis and iv) a closing meeting after the intervention activities.	n=388 geriatric nurses (senior and staff nurses) in nursing homes in four regions in North Germany. Intervention Group (IG): n=146 Control Group (CG): n=242	2004-2005	At baseline, no difference between the IG and the CG was found with respect to skin changes or work-related behaviour. At follow-up, the frequency of skin disease was significantly reduced in the IG, from 26% at baseline to 17% at follow-up, whereas the frequency remained almost unchanged in the CG. Effects on behaviour in the IG included significant increases in the use of moisturizers and hand disinfection instead of hand washing. The provision of cotton gloves and barrier cream products increased at intervention workplaces.

Cohort Studies

The following two epidemiological studies investigated the incidence of work-related hand eczema amongst hairdressers and car-industry workers in Sweden and Germany respectively and their main characteristics are outlined in table 2.5.

Funke, Fartasch and Diepgen (2001) examined work-related hand eczema amongst three different apprenticeships (metalworkers, white and blue-collar workers) in the car industry and followed-up these groups in a three year-period. A prospective cohort was conducted where examinations carried out by occupational physicians before, during (after the 1st year of apprenticeship) and after the apprenticeship period. The risk factors that were examined were the following: atopic skin disease, history of hand eczema, domestic risk factors, exposure to irritants at the workplace and use of barrier creams. The paper discussed only descriptive results; therefore, methods of analytical epidemiology were not available to explain the exogenous and endogenous risk factors of hand eczema. The authors concluded that there were differences between the hand eczema risks amongst different apprenticeships and that their results are representative of various occupations (with the proviso of an identical job description). Funke, Fartasch and Diepgen (2001) attributed this conclusion to the fact that the apprenticeships that were investigated included all the typical tasks and task-associated exposures to irritants at work.

Lind et al. (2007) conducted a longitudinal retrospective cohort study amongst female graduates from vocational schools for hairdressers in Sweden between 1970 and 1995. The aim of this epidemiological study was to estimate the occurrence of hand eczema in this group. Lind et al. (2007) used a stratified sample from the general population to act as control. The methods used to ascertain the incidence rates amongst the hairdressers were self-administered questionnaires that included specific questions about skin atopy, working periods, the occurrence of hand eczema and the number of hair treatments performed per week. The incidence rates of hand eczema were higher in younger hairdressers under the age of 25 which was also the same in the control group. Participants who had history of childhood eczema in both hairdressers and the control group also presented high incidence of hand eczema; however, only 10%

of hand eczema cases in the hairdressers would be prevented if no one with skin atopy entered the profession. The results of the study were compared against the general Swedish population and other previous register-based studies; therefore, extrapolation of the findings to wet work occupations was difficult and constituted one of this study's weaknesses. The authors concluded that hairdressers are highly exposed to skin-damaging substances, therefore, preventative measures of developing hand eczema should be the main focus in the future (Lind et al. 2007). Moreover, the authors reported that when compared to other studies, self-reported incidence of hand eczema was substantially higher. Such findings may have been subject to bias (overestimation) due to the use of self-administered questionnaires to ascertain incidence rates of eczema.

Table 2.5 Cohort Studies

Cohort Studies				
Authors & Year of publication	**Methods**	**Population/Sample**	**Time Frame**	**Key findings**
Funke et al. 2001	Questionnaires, interviews and examinations of hands.	A total of 2222 examinations were initially performed at application stage. 2078 individuals started the apprenticeship out of which 58% were metalworkers, 33% were Blue-collar workers and 9% were White-collar collars. A total of 1990 apprentices returned for the second examination and 1910 for the third examination.	1990-1994 (Ingolstadt) 1991-1994 (Neckarsulm)	Significant differences between hand eczema risks already exist in different apprenticeships. Due to the fact that apprenticeships include all typical tasks and task-associated exposures to irritants at the workplace, the results were representative of the car industry and also other occupations with identical job descriptions. Allergic hand eczema did not play a significant role, whereas irritant hand eczema in context with susceptible skin appeared to be important.
Lind et al. 2007	Longitudinal retrospective cohort study. Self-administered questionnaires.	A total of n=3665 hairdressing graduates form vocational schools in Sweden and a total of n=5034 population controls returned the questionnaire.	From 1970 to 1995	Compared with the general population, a higher incidence rate of hand eczema occurs in younger ages amongst Swedish hairdressers. Hairdressers are highly exposed to skin – damaging substances. Self-reported hand eczema was higher among hairdressers compared to the control group. A 10% of hand eczema cases if the hairdressers would be prevented if no one with skin atopy entered the profession.

2.5 Discussion

The section below discusses the types of studies identified in the narrative review as well as the themes that emerged from these studies: high-risk wet work occupations and the prevention of OIHD.

2.5.1 Types of studies

Table 2.6 summarises the different types of studies and their thematic area following the narrative review.

Table 2.6 Types of studies identified

Type of study	Literature reviews	Report	Epidemiological Studies	RCTs
Theme	Treatment and prevention of occupational skin disease	Outcomes, prognostic factors and assessment of occupational contact dermatitis	Incidence of occupational hand eczema	Effectiveness of interventions for the prevention of occupational skin disease
Methods	Quantitative Systematic Reviews	Research in four different areas: long-term follow-up study, short-term follow-up study, development of skin exposure assessment tool and hazard surveillance at work	Cohort studies	Intervention studies using control groups
Total	3	1	2	4

Epidemiology of Occupational Skin Disease

Epidemiological studies are of great importance as they can inform us of disease distribution and its determinants and at the same time monitor the effect of preventive measures in the population of interest (Bhopal 2002). Following this narrative review of the literature it became apparent that epidemiological studies that concern occupational skin diseases were scarce. Incidence and prevalence data that concern occupational skin diseases are collected from different data sources in the UK, Europe as well as the U.S.A. (Nicholson et al. 2010; Elsner 2007; Diepgen and Coenraads 1999). The reporting criteria of occupational skin diseases differ across the reporting registries since the data come from national surveys or reporting schemes used by dermatologists or physicians. Contributory factors to the lack of epidemiological studies are also considered to be the following: diagnostic bias, the distribution of allergic and irritant contact dermatitis in the working population, social and economic impact as well as the need for intervention studies (Diepgen and Coenraads 1999). Consequently, understanding and exploring the extent to which OIHD exists within a sample of the NHS Grampian wet work population constituted a fundamental element that underpinned this DPP project. Understanding the epidemiology of occupational skin disease amongst wet workers on a national and local level is essential in order to determine the etiological and contributory factors of the disease before making recommendations for its prevention in that particular area.

Treatment and Prevention of Skin Disease

The three systematic reviews discussed above aimed to explore the treatment and prevention of OIHD amongst wet workers in different high-risk occupations including HCWs.

The review regarding the management of occupational skin disease among HCWs (Smedley et al. 2011), focused on the infection risks and the programs already in place to address existing issues. The results of Smedley et al.'s (2011) review suggested that further research is required to ascertain transmission of infection to patients and the effectiveness of health surveillance in reducing skin issues at work. With regards to treatment, evidence from Smedley et al.'s (2011) findings showed that both lipid-rich moisturisers and corticosteroid creams effectively treat both contact and allergic dermatitis.

Key findings of the prevention reviews (Bauer et al. 2010; Saary et al. 2005) highlighted that the identified studies were limited in size, however, that did not imply that the interventions undertaken were ineffective. Moreover, the target populations varied, including mixed populations (individuals with or without pre-existing skin problems). Although improvement of skin issues in the intervention groups was reported in some studies, it was not possible to ascertain whether that was attributed to the effectiveness of the intervention as a primary prevention technique or due to the effectiveness of interventions in reducing symptoms of pre-existing skin disease. Evidence suggested the need for larger-scale studies in order to investigate the primary prevention of OIHD and explore the various preventative strategies as the current evidence was insufficient to determine the effectiveness of interventions (Bauer et al. 2010). Heterogeneity in methods assessing OIHD was observed in all the systematic reviews. Studies used validated self-reported questionnaires and /or clinical examinations (not always blinded) based on the aims and objectives of the study. Although medical examination is accepted as the gold standard, evidence from a UK study indicated that the prevalence of dermatitis could be reasonably estimated by using questions alone in the populations of interest (Williams et al. 1996). Further, the results regarding preventative measures were inconclusive as different intervention strategies were used in the studies, rendering any combination or comparison impossible.

The gaps identified in the initial narrative review (mixed populations, heterogeneity of interventions, methodological weaknesses e.g. lack of standardised assessments for OIHD identification and limited results from the search), generated the need for the development of a focused review. More specific search of the literature will enable the identification of evidence of best practice in primary prevention of OIHD. A targeted systematic review is required to explore whether comparison of results in epidemiological studies, workplace assessments and interventions is feasible; it will also contribute to future research by providing useful information of the evidence identified.

Effectiveness of interventions for Skin Disease Prevention

Additional research has focused on prevention of occupational skin disease across high-risk wet work occupations. The ten studies identified in the narrative review of the literature, investigated the effects of interventions on cleaners, metal workers and HCWs. Only quantitative studies (RCTs) were identified in the initial narrative review of the literature. Evidence suggests that implementation strategies on behaviour and behavioural determinants can enhance the prevention of occupational skin disease. Implementation strategies underpin the knowledge and understanding that is required in order to change behaviour and/or existing practices (Atkins et al. 2017). Understanding of the mechanisms that determine the effectiveness of interventions is crucial in behavioural change (Michie 2008). The results of the RCT studies suggest that there is variety of intervention strategies within the high risk wet occupations and in particular amongst HCWs which are worth considering in future research. This thesis aims to explore the experiences, perceptions and needs of wet workers in relation to OIHD prevention by using both quantitative and qualitative methods. This will allow the collection of different types of data, in order to best explore the topic area which has been thus far explored mainly through quantitative approaches. Moreover, it will contribute to the greater body of knowledge and research by exploring additional perspectives around the prevention of OIHD.

2.5.2 High-Risk wet work occupations

The most prevalent high-risk wet work occupations associated with occupational skin disease as outlined in the studies discussed above were: hairdressers, cleaning and kitchen workers, metal workers and HCWs across different countries (UK, Germany, Sweden, and Netherlands). In the section that follows below, discussion takes place regarding the identified high-risk occupations. Further evidence emerged following hand searching in the databases and in the reference list of the above papers (except from the three systematic reviews) which will be discussed in the section below. These papers were not reported in the narrative review as they did not fulfil the criteria for the review. However, they are relevant to the discussion of this section and chapter.

2.5.2.1 Hairdressing

Hairdressing is one of the wet work occupations affected the most by hand dermatitis (HSE 2019; Lyons et al. 2013). Hairdressing procedures as well as frequent wetting of hands and contact with chemicals are the major risk factors for developing occupational skin disease affecting female workers (Perkins and Farrow 2005). Hairdressing is amongst the occupations with the highest rates on the HSE annual reports (HSE 2018).

2.5.2.2 Cleaning, Kitchen work, Industrial work (metal/printing/dye)

Wet work exposures such as the use of occlusive gloves, contact with detergents and abrasives consist of risk factors of developing hand dermatitis amongst professional cleaning workers (Mirabelli et al. 2012). In 1993, Halkier-Sorensen and Thestrup-Pedersen studied the effects of using a moisturiser versus no intervention among 111 cleaners and kitchen workers. The study found that whilst using a moisturiser no participant developed OIHD. Wet work is the main cause of occupational dermatitis in the cleaning industry (Jungbauer et al. 2004) In their study Jungbauer et al. (2004) also reported that the level of education regarding skin care and skin protection in this group of workers was low and recommended that the need of a skin protection implementation programme is eminent to achieve behavioural change on the basis that skin protection among this group will only be achieved if they are aware of why and how to protect their skin (Jungbauer et al. 2004a).

Food and certain manufacturing related occupations (metal work) are also amongst the reported occupations with the highest rates of work-related skin disease (HSE 2018). Studies regarding food industry identified that wet work as well as contact with detergents were amongst the common irritants (Teo et al. 2009). Moreover, Sell et al. (2005) studied employees at five Danish cheese dairies. They reported that wet workers were exposed to different cleaning agents, milk, cheese, brine and salt which known to have a drying effect on the skin. Exposure to wet work and contact with metal fluids is highly common among metal workers. Funke, Fartasch and Diepgen (2001) reported increased cumulative incidence rates in apprentices employed as metal workers in the car industry. Similarly, Livesley et al. (2002) studied the Nottinghamshire printing industry population reported high prevalence (approximately 40%) of dermatitis amongst 490 employees. The dermatological effects of chemicals in the printing industry are associated with ink components, however, the participants of this study also reported issues with the gloves worn at work (causing latex allergy), the (high) temperature of their working environment as well as its ventilation (Livesley et al. 2002).

2.5.2.3 Healthcare workers

Healthcare workers including nurses, auxiliaries, dental nurses and dental practitioners are amongst the occupations of high incidence rates for work-related skin disease (HSE 2018). Wet work as well as contact with irritants contained in detergents and gloves are the most common risk factors for developing occupational skin disease in healthcare settings (Jungbauer et al. 2004b). Poor hand drying techniques as well as poor skin care are also contributory factors to high hand dermatitis prevalence (WHO 2009). Nurses in particular are amongst the HCWs with the highest risk of developing hand dermatitis. In a sample of 1375 geriatric nurses from 86 nursing homes, the estimated point prevalence was 18% (Skudlik et al. 2009). Mending Wrangsjo and Jarvolm (2005) conducted a 15 year follow-up study of 1115 patients diagnosed with hand eczema in Sweden. The study reported that prognosis of hand eczema was poor and varied in the long-term. A third of the patients required ongoing medical treatment, with the majority of the patients experiencing negative psychological effects (Mending Wrangsjo and Jarvolm 2005). Work-related consequences were also reported for a 5% of the patients who went on long-term sick leave or had to change their professions. The nature of occupational skin disease is multifaceted and can impact on the health, the wellbeing as well as have career implications for the individual.

2.5.3 Prevention

Studies have investigated a variety of measures that can be used to prevent occupational skin disease in nurses; i) moisturisers, ii) hand hygiene techniques, iii) personal protective equipment and iv) skin care programmes.

The use of moisturiser creams can prevent the development of occupational skin disease (Nicholson et al. 2010). Saary et al. (2005) in their systematic review reported mixed-evidence for the effectiveness of applying pre-work barrier creams. Winker et al. (2009) reported that pre-work barrier creams can improve skin condition if combined with after-work creams, however they are not effective as a preventative measure (Nicholson et al. 2010). Development of preventative measures against occupational skin disease amongst nurses, are related to the application of moisturisers along with other important factors (Held et al. 2001). Following the recommended hygiene techniques for hand washing and drying is pivotal in good skin hygiene and care, and also to prevent bacterial transmission (WHO 2019; WHO 2009). Huang et al. (2012) reported that hand drying with paper towels is superior to using electric air dryers, therefore, it should be considered in clinical environments for hygienic efficacy.

Appropriate use of personal protective equipment (selection of glove type, correct fitting, safe removal and maintenance as per the product’s specifications) such as use of occlusive gloves is safe practice and reduces exposure to factors responsible for the development of occupational skin disease (Nicholson et al. 2010). Glove wearing alone is not a preventative measure for occupational skin disease. It is also important to mention that although rubber gloves are reducing exposure to factors that can cause occupational skin disease, some types of gloves such as the latex gloves, can cause occupational contact dermatitis and urticaria (Royal College of Physicians 2019). When use of latex gloves is unavoidable, application of hand creams prior to wearing the gloves should be avoided as it can trigger the uptake of allergenic substances contained in the gloves (Royal College of Physicians cited in Nicholson et al. 2010). Saary et al. (2005) also reported in their systematic review that wearing cotton liners was found effective in preventing occupational skin disease.

Skin care programmes incorporating a variety of measures to prevent occupational skin disease have been found to be beneficial to some degree amongst HCWs (Loffler et al. 2007; Jungbauer et al. 2004; Held et al. 2001). The evidence showed that implementation strategies of incorporating educational programmes and training for staff and managers have reduced the incidence of occupational skin disease (Sell et al. 2005; Flyvholm and Frydendall-Jepsen 2008). The implementation of plans for behavioural change interventions in healthcare was advanced by the use of psychological theory. Boscart et al. (2012) explored behaviours associated with hand hygiene amongst nurses by using the Theoretical Domains Framework (TDF) developed by Michie et al. in 2005. In order to alter behaviours and practices within organisations and services, change in the individual and collective behaviour is required (Atkins et al. 2017). Behavioural theories can help understand implementation problems and inform implementation interventions (Michie et al. 2011). Finally, there is still uncertainty regarding the benefits and the effectiveness of skin care programmes for nurses (van der Meer 2014). The need for evidence-based interventions based on behavioural change for the prevention of occupational skin disease amongst HCWs is imminent.

2.6 Summary

The initial review of the literature identified a body of -mainly quantitative- studies dedicated to exploring effectiveness of interventions to prevent OIHD amongst high-risk occupations, across different countries. A wide range of concepts (types of preventative strategies, standardised assessments/tools of

OIHD, investigation of specific populations) across various high-risk occupations and especially amongst HCWs merit attention for future research.

Several limitations were established relating to the initial review of the literature; these concerned research designs and assessment tools, while there was a notable overall lack of epidemiological studies regarding occupational skin disease. Moreover, the results of the databases search were limited to only a few. It is possible that these limitations may be attributed to the search terms used by the researcher as there are differences and variations in definitions in the literature specifically in the field of occupational skin diseases (Nicholson 2010). Future research should focus on addressing the identified limitations in order to contribute to the existing body of knowledge.

2.7 Thesis aims and research questions

This DPP research project will use a three-study approach to explore aspects of OIHD amongst HCWs. The three studies of the DPP project will each make a stand-alone contribution in an effort to:

i) establish the period prevalence and incidence of OIHD, on a local and national level
ii) identify, appraise and synthesise the best available evidence on the effectiveness of interventions aimed at OIHD prevention and
iii) capture HCWs' opinions, beliefs and experiences about skin health and care at the workplace

The overall aim of this thesis is to inform the development of an evidence-based intervention to promote self-care and to prevent OIHD in HCWs within NHS Grampian. In fulfilment of the above aim, specific to each study, aims and research questions were developed and will be presented in chapter 3.

Chapter 3

Methodology

3.1 Introduction to the chapter

This chapter reviews and presents the research methodologies and theoretical framework which underpin this thesis. Specific aspects of sampling frames, data collection, and analysis for all three studies of this DPP project are discussed and justified for the chosen approaches in relation to how they were integrated into this thesis.

3.2 Rationale of the DPP project

3.2.1 The purpose of the DPP project and reasons for design type

Recent research suggests that there is a lack of robust evidence regarding the prevention of OIHD and that further targeted research is urgently required, both to identify accurate epidemiological numbers and to increase the efficacy of prevention measures that emerge from intervention studies (Bauer et al. 2018; Skudlik et al. 2012; Bauer et al. 2010). Such studies are essential for the investigation and exploration of the efficacy of primary (i.e.: disease avoidance) and secondary prevention (i.e.: early detection and management of symptoms) of OIHD.

3.3 Aim and Objectives

3.3.1 Aim

Based on the MRC Guidance for Developing and Evaluating Complex Interventions (Craig et al. 2008), this research project aimed to inform the development of an evidence-based intervention designed to promote self-care and to prevent OIHD in HCWs within NHS Grampian and other healthcare institutions. The outcome of this thesis will provide important knowledge to enhance the health and wellbeing of such workers and will inform the design of an evidence-based intervention. The development, implementation and evaluation of an evidence-based intervention is intended to follow on from this research.

3.3.2 Objectives

In fulfilment of the above stated aim, the objectives of this project were to:

1. determine the reported period prevalence and incidence of OIHD in wet workers and in particular amongst HCWs in the UK and Grampian region between 2010 and 2015;

2. identify international current best practice in the prevention of OIHD in wet work professions;

3. explore the experiences, perceptions and needs of HCWs in relation to prevention of OIHD using a mixed methods approach;

4. inform the development of an evidence-based intervention informed by the outcomes of the objectives 1, 2 and 3.

3.4 Methodology

There are three main approaches to studying research topics: quantitative, qualitative and mixed methods. This section will discuss briefly each of these approaches and then elaborate on the approach used in this research project.

3.4.1 Quantitative Research

Quantitative methodologies are underpinned by a positivist model which proposes that scientific truths or laws exist (Gerrish and Lathlean 2015). Quantitative research is usually referred to as empirical or scientific, as turning information or data into numbers is one of its main characteristics and has been traditionally used in sciences such as physics, chemistry and biology (Silverman 2013). The methods employed in quantitative research use validated research tools developed to minimise bias for what can be observed and measured (Gerrish and Lathlean 2015). The ultimate aim of quantitative research is to produce reliable and valid results.

3.4.2 Qualitative Research

Qualitative methodologies, in contrast, are associated with the interpretivist model, which offers a degree of flexibility in order to understand the meaning of social phenomena and human behaviour (Silverman 2013). Qualitative research employs methods such purposeful sampling, collection of open-ended data, etc.)

and techniques to allow interpretation that takes into account complexity, detail and social context (Gerrish and Lathlean 2015). Qualitative studies usually lack the necessary standardisation to maintain authenticity of the data where methods and tools such as semi-structured interviews or observation are used and findings are presented verbally or in a non-numerical form (Gerrish and Lathlean 2015).

3.4.3 Mixed methods research

Mixed methods research is a design where quantitative and qualitative approaches are blended through the use of combined methods using different yet complementary approaches (Becker 1996). Mixed methods research has been called the 'third methodological movement' following qualitative and quantitative research (Creswell and Plano Clark 2011). Authors sought consensus about a definition for three decades. Creswell and Plano Clark (2011) provided a definition of mixed methods combining elements for both methods and philosophy;

'…Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method, it focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone…' (Creswell and Plano Clark 2011 p.5).

The use of mixed methods in the past four decades has increased globally across disciplines, diverse projects and journals (Creswell and Plano Clark 2018; Poth 2018). Lipscomb (2008) observed a steady increase of mixed methods research particularly among nurse researchers between 1997 and 2006. His electronic search of abstracts used the truncated phrase '*mixed methods'* in both the British Nursing Index (BNI) and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Lipscomb (2008) acknowledged that although mixed methods can have multiple advantages over single method research, nurse researchers make insufficient justification of their theoretical decisions.

Consequently, the validity of methods and methodological decisions could be compromised due to broken or unjustified chains of reasoning. Therefore, it is vital to identify the most suitable philosophy to underpin this DPP project, articulate the philosophical assumptions that arise and justify how this philosophy fits into this research project.

3.5 Theoretical Framework

This research project was conducted within a theoretical framework, described in this section.

3.5.1 Definition of Theory

The word 'theory' is derived from the ancient Greek word 'theoria' (θεωρία) that meant 'looking at' or 'contemplate' or 'speculate'. Amongst the modern definitions theory has been defined as 'A supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained' (Oxford English Dictionary 2019). Theories are sets of concepts used to define and/or explain some phenomenon (Silverman 2013). Theory can mean different things to different people/disciplines (Robson 2011). Research concerns the understanding and explanation of the relationship between theory, philosophy, methodology and methods (Howell 2013). Irrespective of the research subject, the intention behind systematic, ethical and sceptical ways of carrying out research is to seek the 'truth' (Howell 2013). Various stances and methodological approaches exist, as illustrated in Table 3.1. Distinctions between them can be identified when one assesses the differences between epistemological and philosophical positions (Howell 2013). Theory also assists researchers to interpret the results they obtained within the context of their discipline (Robson 2011). Theory within the context of this DPP research project will provide theoretical understanding of the issue/problem of interest (OIHD amongst HCWs). The correlation of theory and findings at the end of this DPP research project will contribute to the development of new practices which will hopefully help resolve the issue (recommendations for the prevention of OIHD).

3.5.1.1 Worldviews

Crotty (1998) contends that there are four major elements in designing a study; the epistemology behind the study, the theoretical perspective, the methodology i.e strategy of the research design, and the methods, i.e. the techniques or procedures. Creswell and Plano Clark (2011) adapted these four elements from Crotty and developed a framework of four levels to position philosophy within a mixed methods study. These levels are as following: (i) Paradigm worldview (e.g. beliefs, epistemology), (ii) Theoretical lens (e.g. social science feminist, racial theories), (iii) Methodological approach (e.g. ethnography, mixed methods), and (iv) Methods of data collection (e.g. interviews, questionnaires) (Creswell and Plano Clark 2011). Creswell and Plano Clark (2011) surround this framework with philosophical assumptions in order to inform the practices of mixed methods research. They call these sets of beliefs and assumptions 'worldviews'. Table 3.1 illustrates the four worldviews and their characteristics.

Table 3.1 Worldviews

	Postpositivist Worldview	**Constructivist Worldview**	**Participatory Worldview**	**Pragmatist Worldview**
Nature of Truth	Determination	Understanding	Political	Consequences of actions
Characteristics of approaches within Worldviews	Reductionism	Multiple participant meanings	Empowerment and issue oriented	Problem centred
Methodological orientation	Empirical observation and measurement	Social and historical construction	Collaborative	Pluralistic
Nature of final outcome	Verification of theory	Generation of theory	Change oriented	Real-world practice oriented

Adapted from Creswell and Plano Clark, 2011

Postpositivism

The postpositivist worldview is associated with quantitative research. Research seeks to develop statements that describe causal relationships or explain situations. It is based on objectivity, tangibility and generalisability and thus narrows and focuses on the variables to interrelate. It makes claims for knowledge based on evidence that is refined or abandoned, and tests theories that are continually redefined (Robson 2011).

Constructivism

The constructivist worldview is associated with qualitative research. Research makes claims for knowledge based on the understanding or meaning of phenomena which are formed through the participants and their subjective views. Research is shaped *'from the bottom up'*, starting from the individual perspectives and moving up to broad patterns and theories (Creswell and Plano Clark 2011).

Participatory

The participatory worldview is often associated with qualitative approaches. Research in this worldview is influenced by political concerns. The claims for knowledge are based on social injustices and the researcher collaborates with individuals who experience these injustices and aims to improve the social world (Creswell and Plano Clark 2011).

Pragmatism

The pragmatist worldview is mostly associated with mixed methods research. The focus of research is to generate knowledge based on the consequences of research. Research question(s) in this worldview are of primary importance rather than the methods. The use of multiple methods of data collection is another characteristic of this worldview (Creswell and Plano Clark 2011). Central features of this worldview are the values and visions of human action and interaction which precede the search for descriptions, theories, explanations and narratives (Cheryholmes 1992). Mertens (2002) argues that it is the values of clients, policy-makers and others in a position of power that are the guides in practice.

A plethora of views and opinions emerged in the past decades regarding which worldview(s) elements relate to specific procedures of mixed methods research (Tashakkori and Teddlie 2003). Researchers, historic figures and many contemporary authors have embraced stances that either suggest one worldview should be used in mixed methods research or that the worldview should be based on how the researcher attempts to know the social world (Creswell and Plano Clark 2011).

3.5.1.2 Elements

Creswell and Plano Clark (2011) further discussed how the four worldviews consist of different elements regarding the nature of reality (ontology), the relationship between the researcher and what or who is being researched (epistemology), the role of values (axiology), the process of research (methodology) and the language of the research (rhetoric). Table 3.2 below shows examples of the differences of these philosophical elements for each worldview.

Table 3.2 illustrates how these elements and different worldviews are translated into practice. For example, ontology refers to the nature of reality when researchers test their hypotheses. More specifically, in the case of the postpositivist, reality is viewed as a singular. Therefore, one overarching theory for the research study helps explain its findings. In contrast, the constructivist views reality as multiple and therefore, seeks multiple perspectives from the participants obtained via multiple interviews, for example. Participatory research finds reality negotiated within a political context where the pragmatist views reality as both singular and multiple (Creswell and Plano Clark 2011). Methodological differences amongst the worldviews is another element example to consider. The postpositivist researcher works from 'top to bottom': from a theory to the hypothesis then through data to reject or accept the theory. The opposite (from bottom up) process followed in the constructivist approaches where data (participants' views) are used to generate theory. In participatory research the researcher involves participants in all the research stages (helping to form questions and analysing the data) and engages in cyclical reviews of the results in practice. Pragmatism entails the researcher combining qualitative and quantitative data and mixing them (Creswell and Plano Clark 2011).

Table 3.2 Elements of Worldviews

Element	Worldview			
	Postpositivist	**Constructivist**	**Participatory**	**Pragmatism**
Ontology Nature of reality	Single reality (researchers reject or accept hypotheses)	Multiple realities (researchers provide quotes to illustrate different perspectives)	Political reality (findings are negotiated with participants)	Single and multiple realities (researchers test hypotheses and provide multiple perspectives)
Epistemology Relationship between the researcher and what is being researched	Distance and impartiality (researchers objectively collect data on instruments)	Closeness (researchers visit participants at their sites for data collection)	Collaboration (researchers actively involve participants as collaborators)	Practicality (researchers collect data by 'what works' to address research question)
Axiology Role of values	Unbiased (researchers use checks to eliminate bias)	Biased (researchers actively talk about their biases and interpretations)	Negotiated (researchers negotiate their biases with participants)	Multiple stances (researchers include both biased and unbiased perspectives)
Methodology Process of research	Deductive (researchers test an a priori theory)	Inductive (researchers start with participants' views and build 'up' to patterns, theories, and generalisations)	Participatory (researchers involve participants in all stages of the research and engage in cyclical reviews of findings)	Combining (researchers collect both quantitative and qualitative data and mix them)
Rhetoric Language used in research	Formal style (researchers use agreed-on definitions of variables)	Informal style (researchers write in a literary, informal style)	Advocacy and change (researchers use language that will help bring about change and advocate for participants)	Formal or informal (researchers may employ both formal and informal writing styles)

Adapted from Creswell and Plano Clark, 2011

3.5.1.3 Theoretical Domains Framework (TDF)

Whilst there are many different theories that can be used as theoretical lenses in health research, there is a key theory in terms of development and use most suitable for this DPP project, the Theoretical Domains Framework (TDF). The TDF is not a theory per se but rather a framework which has been derived from 33 theories of behaviour change and 128 constructs organised into overarching domains (initially 12 and now extended to 14 domains) (Stewart and Klein 2016). Theoretical Domains Framework was developed by a multi-disciplinary group which included psychological theorists, health service researchers and health psychologists with the aim of simplifying and integrating the plethora of behavioural change theories to make theory more accessible to other disciplines (Cane, O'Connor and Michie 2012). The TDF has been used by research teams across several healthcare systems to explain implementation problems as well as to inform interventions (Stewart and Klein 2016). For example, in Canada it was used to explore the barriers and facilitators to current hand hygiene practices. The TDF was then used while implementing an intervention to improve hand hygiene and contribute to a safer and better quality care for the patients (Boscart et al. 2012). TDF has been embedded into a variety of research methodologies ranging between RCTs to phenomenology investigating fields such as hand hygiene, smoking cessation, mental health and acute low back pain (Cane, O'Connor and Michie 2012). The 14 overarching domains are outlined briefly in table 3.3 below.

One of the many merits of using TDF as a theoretical framework in healthcare research is its flexible nature. Theoretical Domains Framework can be used in both quantitative and qualitative research in order to understand and characterise the domains that are relevant to behaviour and required to be targeted in any intervention (Stewart and Klein 2016). TDF in quantitative research, for instance, can contribute to the data collection tools such as questionnaires with items of the questionnaire mapped onto TDF domains (Stewart and Klein 2016). In qualitative research TDF domains can be used to develop semi-structured interview schedules as well as to assist with coding and thematic analysis (Huijg et al. 2014). Theoretical Domains Framework has been embedded to a variety of research methodologies in healthcare including hand hygiene (Boscart et al. 2012).

Table 3.3 Refined framework domain

Domain	Definition
Knowledge	Awareness of the existence of something (e.g. procedure or task)
Skills	Ability or proficiency acquired through practice (e.g. competence, interpersonal skills)
Social/Professional Role and Identity	A set of behaviours and personal qualities of an individual in a social or work setting (e.g. professional identity as a nurse)
Beliefs about capabilities	Personal beliefs that an individual can put in place (e.g. self-esteem, professional confidence)
Optimism	Positive expectations of desired goals (e.g. optimism, unrealistic optimism)
Beliefs about Consequences	Personal beliefs about outcomes of a behaviour in a given situation (e.g. positive or negative expectations)
Reinforcement	Influences that increase the probability of particular behaviours (e.g. reinforcement, punishment, rewards)
Intentions	A conscious decision to act in a certain way (e.g. perform in a certain behaviour)
Goals	Mental representations of outcome (e.g. action planning, target-setting)
Memory, Attention and Decision Processes	The ability to retain information, focus selectively on aspects of the environment (e.g. attention control, decision making)
Environmental Context and Resources	Positive or negative influences of a person's situation that affects the development of skills and abilities (e.g. environmental stressors, resources, barriers and facilitators)
Social Influences	Interpersonal processes that can cause individuals to change their behaviours, feelings, thoughts (e.g. social pressure, power, group comparisons)
Emotion	Complex reaction patterns by which the individual attempts to deal with (fear, depression burn-out positive, negative affect)
Behavioural Regulation	Anything that can manage or change objectively observed actions (e.g. self-monitoring, action planning)

Adapted from Cane, O'Connor and Michie 2012

3.5.2 Current DPP project

The practical matters that concerned this thesis were mainly guided by the HCWs' practices and experiences rather than a particular theory. Although this thesis did not aim to study the HCWs' behaviours at this stage, the TDF was adopted as an overarching theoretical lens to provide a framework for the development of an evidence-based intervention in the future based on the findings that emerged from the three studies.

Each of the three studies of this thesis was designed to use different tools for data collection and analysis; therefore, the methodology in each study adopted epistemological elements from post-positivism and pragmatism. These will be discussed further later in this chapter.

3.6 Research Design

Combining methods in research is a challenging task. Mixed methods research, in essence, includes a minimum of one quantitative and one qualitative approach to collect, analyse and interpret the findings (Creswell and Plano Clark 2018). There are six mixed methods research designs as outlined in table 3.4. Integrating quantitative and qualitative data can take place using various ways to achieve different goals. Designs have been developed where:

- One set of data could help explain another data set and/or check its validity (convergent parallel mixed-methods)
- One set of data could help explain the other set and/or explore different types of questions (explanatory sequential mixed-methods)
- One set of data could lead to the use of better tools for a sample or population (exploratory sequential mixed-methods)
- One set of data could build on other set and/or alternate between them during longitudinal studies (transformative, embedded, multiphase designs) (Creswell and Plano Clark 2018).

The mixed methods research design selected to inform the structure of this project was the explanatory sequential. This design was chosen as the most appropriate in order to best explore, understand and explain the quantitative evidence aimed to be collected from Studies I and II. Once the key findings from Studies I and II were elicited and analysed, further exploration of these findings would take place by conducting semi-structured interviews in subsequent Study III.

Another reason for using this design was that the field of interest and type of data to be collected and analysed in Studies I and II were of a strongly quantitative orientation (Creswell 2014). More specifically, Study I aimed to determine the probable period prevalence of OIHD at a national and local level by reviewing the relevant databases. Study II aimed to conduct a systematic review of the world-wide literature in order to assess the effectiveness of interventions aimed to prevent OIHD.

Blending quantitative and qualitative methods provided the researcher with an equal value of collecting and analysing both types of data (Poth 2018). Such an approach allowed better understanding and exploration of the gaps in research and literature and set a robust and vigorous evidence base for the development of an intervention in accordance with the MRC Guidance for developing and evaluating complex interventions (Craig et al. 2008).

Table 3.4 Mixed methods research designs

Prototypical designs	Convergent parallel design	Explanatory sequential design	Exploratory sequential design	Embedded design	Transformative design	Multiphase design
Definition	Concurrent qualitative and quantitative data collection, separate analyses and the merging of the two data sets	Methods implemented sequentially, starting with quantitative data collection and analysis in Phase 1 followed by qualitative data collection and analysis in Phase 2 which builds on Phase 1	Methods implemented sequentially starting with qualitative data collection and analysis in Phase 1 followed by quantitative data collection and analysis in Phase 2, which builds in Phase 1	Either the concurrent or sequential collection of supporting data with separate data analysis and the use of the supporting data before, during, or after the major data collection procedures	Framing the concurrent or sequential collection and analysis of quantitative and qualitative data sets within a transformative, theoretical framework that guides the methods decisions.	Combining the concurrent and/or sequential collection of quantitative and qualitative data sets over multiple phases of a program of study.
Design purpose	Need a more complete understanding of a topic Need to validate or corroborate quantitative scales	Need to explain quantitative results	Need to test or measure qualitative exploratory findings	Need preliminary exploration before an experimental trial Need a more complete understanding of an experimental trial, such as the process and outcomes Need a follow-up explanations after an experimental trial	Need to conduct research that identifies and challenges social injustices	Need to implement multiple phases to address a program objective, such as for programme development and evaluation
Typical paradigm foundation	Pragmatism as an umbrella philosophy	Postpositivist in Phase 1 Constructivist in Phase 2	Constructivist in Phase 1 Postpositivist in Phase 2	Worldview may reflect the primary approach or pragmatism if concurrent Constructivist for the qualitative component and	Transformative worldview as an umbrella philosophy	Pragmatism if concurrent Constructivist for the qualitative component and postpositivist for the quantitative

				postpositivist for the quantitative component if sequential		component if sequential
Level of interaction	Independent	Interactive	Interactive	Interactive	Interactive	Interactive
Primary Mixing strategies	Merging the two strands: -After separate data analysis -With further analyses	Connecting the two strands: -From quantitative data analysis to qualitative data collection -Use quantitative results to make decisions about qualitative research questions, sampling and data collection in Phase 2	Connecting the two strands: -From qualitative data analysis to quantitative data collection -Use qualitative results to make decisions about quantitative research questions, sampling and data collection in Phase 2	Embedding one strand within a design based on the other type: -Before, during, or after major component -Use secondary results to enhance planning, understanding, or explaining of primary strand	Mixing within a theoretical framework: -Merging, connecting or embedding the strands within a transformative theoretical lens	Mixing within a program-objective framework: -Connecting and possibly merging and /or embedding within a programmatic objective
Common variants	-Parallel databases -Data transformation -Data validation	-Follow-up explanations -Participant selection	-Theory development -Instrument development	-Embedded experiment - Embedded correlational design -Mixed methods case study -Mixed methods narrative research -Mixed methods ethnography	-Feminist lens -disability lens Socioeconomic class lens	-Large-scale program development and evaluation projects -multilevel state-wide studies -Single mixed methods studies that combine both concurrent and sequential phases

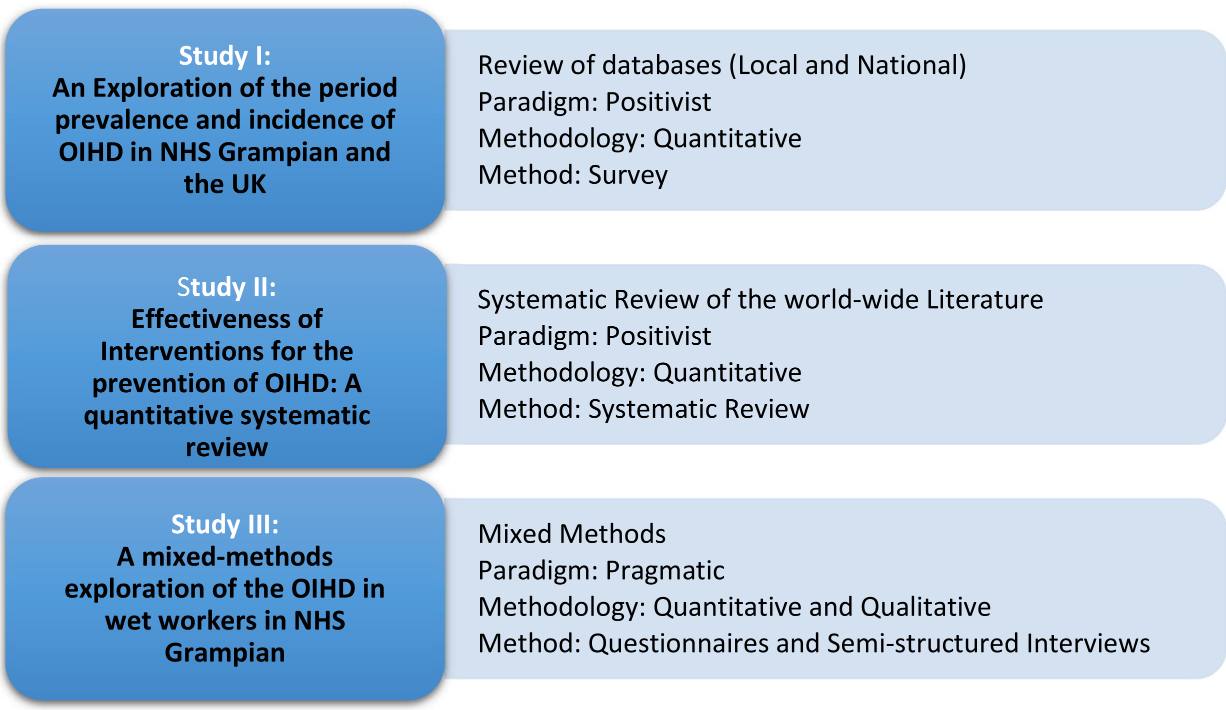
Adapted from Creswell and Plano Clark, 2011

A research design is a crucial part of any research project. It concerns various aspects of the research such as the purpose of the research, its conceptual framework, the research questions and the methods and sampling strategies to be used (Robson 2011). All these aspects need to be interrelated and kept in balance as they inform the manner of investigation that is used within quantitative, qualitative and mixed methods approaches. The following section will briefly discuss the current research design as well as quantitative, qualitative and mixed methods designs.

3.6.4 Current research design

The current DPP project utilised mixed methods as the overarching methodological approach which encompassed the three interrelated studies. Studies I, II and III were the steps the researcher followed in order to i) understand the extent to which OIHD affects wet workers in the UK, ii) identify which interventions are effective in preventing OIHD and in which context and iii) explore the views and experiences of NHS Grampian wet workers towards skin health and care at the workplace, with the aim of informing the development of an evidence-based intervention to prevent OIHD. Figure 3.2 below outlines the research paradigm, methodology and method(s) for each of the three studies:

Figure 3.2 Schematic summary of the DPP research project approaches



Collecting and analysing quantitative data in Study I, allowed the researcher to determine the reported period prevalence of OIHD in wet workers and in particular amongst HCWs in the UK and Grampian Region, between 2010 and 2015. The quantitative systematic review of the world-wide literature (Study II) which followed Study I, aimed to identify and synthesise the best available evidence concerning the effectiveness of interventions to prevent OIHD. Study III explored the determinants of OIHD through the wet workers' experiences and attitudes on how to best prevent it.

3.7 Research Methods

There is a plethora of methods that can be used in research to collect and analyse data. Table 3.5 below outlines data collection methods and the key features that are typically associated with qualitative, quantitative and mixed methods research. In-depth discussion of the methods employed specifically for each of the three studies takes place within the corresponding chapters (4, 5 and 6) later in the thesis.

Table 3.5 Research methods used in quantitative qualitative and mixed methods research

Design	Method	Key Features
Quantitative	Questionnaires/Surveys Experiments	Ability to collect unambiguous and easy-to-count answers leading to quantitative data analysis. Ability to observe cause and effect between two or more conditions. The researcher manipulates some aspect of the phenomenon (independent variable) under study and observes the outcome (dependent variable).
Qualitative	Observational studies Interviews Focus Groups	Ability to gain detailed information that can contribute to the understanding of people, behaviours, interactions or events. Ability to explore a phenomenon, understand the context, generate a hypothesis or theory to explain social processes and relationships. Ability to clarify, explore or confirm ideas with a range of participants on a pre-defined set of issues.
Mixed Methods	Case Studies Consensus methods (e.g. Delphi technique, consensus development panels, nominal group process) Action research Document research (e.g. written audio visual or image record)	Ability to explore a phenomenon in its context and assume that this context is of significance to the phenomenon. The ability to establish the extent of consensus and in some cases develop it. The ability to interpret and explain social situations whilst implementing a change intervention. Documents can be a source of or for mixed methods research. Both quantitative and qualitative methods can be used to extract data from documents and the same of the analysis.

Adapted from Bowling 2014; Gerrish and Lacey 2006

3.8 Summary

This chapter has provided an overview of the research philosophies, outlined the research methodologies and designs and justified the selected ones in fulfilment of this DPP project. The following chapters (chapters 4, 5, and 6) will report on the methods, results and will discuss the findings in relation to Studies I, II and III. Table 3.6 below, presents the specific to each study aims and research questions that were developed. The final thesis chapter which is the discussion (chapter 7) will bring this together by considering all the findings of the DPP project, their implications for practice and research and potential impact.

Table 3.6 DPP Project Design

DPP Project Design	Aim	Research Question(s)
Study I Review of the local and national databases	To determine the reported period prevalence of OIHD in wet workers and in particular amongst HCWs in the UK and Grampian region between 2010 and 2015.	**National Databases** • What is the reported national prevalence of OIHD for wet workers (period prevalence for each of the six years)? • Which are the work groups/occupations of wet workers affected the most? **Local/Regional Database** • What is the annual incidence and prevalence of OIHD between 2010 and 2015 (period prevalence for each of the six years)? • What is the profile of wet workers reported in the OHS OPAS database (e.g. age, gender, type of occupation, pre-existing/underlying skin conditions)? • Do the occupational groups under surveillance appear to represent commonly accepted high-risk working areas for wet-work?
Study II Systematic Review of the world-wide literature	To identify, appraise and synthesize the best available evidence on the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions (a combination of two or more of the interventions listed here) in preventing OIHD in wet workers, comparing each	• What is the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions in preventing OIHD in wet workers?

	intervention to an alternative intervention or to usual care (workers' regular skin care regimen).	
Study III Mixed Methods	To collect information on the distribution and determinants of OIHD in a sample of wet workers referred to OHS in NHS Grampian (for exposures within and outside the workplace) in 2015 and explore the demographics of the sample as well as experiences, perceptions and needs of wet workers in relation to prevention of OIHD using a mixed methods approach.	**Quantitative Approach** • What are the socio-demographic and occupational history characteristics of the wet workers who have been referred to NHS Grampian OHS for various health issues (including skin-related) in 2015? • What is the distribution and determinants of OIHD on hands and wrists/forearms amongst the wet workers referred to NHS Grampian OHS for various health issues (including skin-related)? • Is there an association between OIHD (on hands and/or wrists/elbows) and the development of atopic symptoms in the sample of wet workers referred to NHS Grampian OHS for various health issues (including skin-related)? **Qualitative Approach** • What are the experiences, attitudes and self-perceived needs of wet workers in NHS Grampian regarding how best to prevent OIHD?

Chapter 4

Study I

Title: An Exploration of the period prevalence of Occupational Irritant Hand Dermatitis in NHS Grampian and the UK

4.1 Introduction to the chapter

Chapter 4 presents the first study in this thesis: a review of the national and local databases for the reported period prevalence and incidence of OIHD. The purpose was to determine the period prevalence of OIHD at a national and local level and the annual incidence and prevalence of OIHD at a local level by conducting a review of the available databases.

4.1.1 Aim

The aim of Study I was to determine the reported period prevalence and incidence of OIHD in wet workers and in particular amongst HCWs in the UK and Grampian region between 2010 and 2015.

4.1.2 Research Questions

(i) What is the reported national prevalence of OIHD for wet workers (period prevalence for each of the six years)?

(ii) Which are the work groups/occupations of wet workers affected the most?

(iii) What is the annual incidence and prevalence of OIHD between 2010 and 2015 (period prevalence for each of the six years)?

(iv) What is the profile of wet workers reported in the OHS OPAS database (e.g. age, gender, type of occupation, pre-existing/underlying skin conditions)?

(v) Do the occupational groups under surveillance appear to represent commonly accepted high-risk working areas for wet-work

The national databases THOR and Labour Force Survey (LFS) tables were reviewed to answer research questions (i) and (ii) and the local/regional database of OHS in NHS Grampian were reviews to answer research questions (iii), (iv) and (v).

4.2 Methodology

A quantitative positivistic approach was employed for Study I. This methodology was considered most appropriate in terms of the research aim which was to determine the reported period prevalence and incidence of OIHD in wet workers locally and nationally between 2010 and 2015.

4.3 Methods

Surveys can be designed to measure specific phenomena in a population of interest at one point in time, where certain parameters (e.g. incidence or prevalence in a population) are being estimated and calculated; these surveys are known as descriptive or cross-sectional (Bowling 2014). Surveys can also be designed to investigate causality between variables at more than one point in time; these types of surveys are known as analytic or longitudinal surveys (Bowling 2014). Although it is difficult to ascertain whether associations between exposure and disease are causal, the use of sets of criteria for reaching causal judgements such as the Bradford Hill criteria, can provide a way of reaching judgements on likelihood (Bhopal 2004). Cross-sectional methods in general do not allow evaluation of causal associations, as they are focused at one point in time; they can, however, identify prevalence trends, they can target large samples and can, furthermore, identify characteristics of interest in the sample (Bowling 2014; Bhopal 2004; Fink 2003). Surveys are also useful on the utilisation of preventive and curative health services with their results assisting health planners to establish health priorities (Dos Santos Silva 1999).

Quantitative data analysis is associated with statistical analysis of the variables, usually conducted by computer software or packages. Models of statistics can be used to describe and present variables (descriptive statistics) or explain and predict the key variables (inferential statistics) in order to respectively answer the research question(s) or accept/reject a hypothesis (Flora 2018). Study I was primarily concerned with determining the period prevalence as well as the incidence of OIHD in wet workers and in particular amongst HCWs in the UK and Grampian region in order to understand and explore the extent of OIHD. Occupational skin disease is often a chronically relapsing disease, therefore, period prevalence would be a more informative choice of measure compared to point prevalence that would include only individuals with actual skin disease (Diepgen and Coenraads 1999). A review of the national databases (data collated and analysed by the HSE and available to the public via the HSE website) first took place followed by a cross-sectional study of the local database (OHS database).

A repeated cross-sectional study was deemed the most appropriate approach to determine the period prevalence of OIHD between 2010 and 2015 as this particular method was able to:

- collect information about OIHD amongst NHS Grampian HCWs over a certain period of time (2010 to 2015)
- identify the period prevalence in each of the six years from 2010 to 2015 and report any changes
- investigate whether any associations between OIHD and the population characteristics (age, gender, type of occupation, pre-existing skin disease) could be made
- report whether OIHD amongst the occupational groups under surveillance represented the commonly accepted high-risk working areas of wet work.

Furthermore, the repeated cross-sectional study was an excellent design for measuring the above properties of the type of surveillance data available in the local and national databases.

4.3.1 Data Collection

4.3.1.1 National Databases

Work-related diseases

A number of data sources provide information regarding the overall scale of work-related diseases (including OSD) in the UK today as well as trends in incidence and identification of high risk jobs and workplace activities. The Labour Force Survey (national survey run by the office for National Statistics) has two modules (i) the Self-reported Work-related Illness (SWI) and (ii) the Workplace Injury where such information is available. Moreover, assessments for Industrial Injury and Disablement Benefit (IIDB), a scheme funded by the Department for Work and Pensions (DWP), provides information on work-related diseases (HSE 2018a). Data from the latter, however have not been reviewed for the purposes of this review since information specific to skin-related injuries was not available.

The national occupational surveillance schemes in the UK are run by the University of Manchester and since 2002 they are known by the acronym THOR - The Health and Occupation Research Network. THOR consists of various different modules which report the greater picture of occupational disease and work-related conditions in the UK. Occupational Physicians Reporting Activity (OPRA) is a THOR scheme which consists of cases reported by occupational physicians working in the NHS across the UK. The most commonly reported diseases in OPRA are musculoskeletal, mental ill-health and a significant number of contact dermatitis cases. OPRA incorporates all of the THOR categories listed below, therefore, the information reported to the scheme provides the bigger picture of occupational conditions in the UK:

- Respiratory: Surveillance of Work-related and Occupational Respiratory Disease (SWORD) - Cases reported by consultant chest physicians.
- Skin: The Occupational Skin Disease Surveillance (EPIDERM) - Cases reported by consultant Dermatologists.
- Musculoskeletal: Musculoskeletal Occupational Surveillance Scheme (MOSS) – Cases reported by rheumatologists.
- Hearing: Occupational Surveillance Scheme for Audiological physicians (OSSA)
- Mental ill-health: Surveillance of Occupational Stress and Mental Illness (SOSMI) – Cases reported by consultant psychiatrists
- Infectious disease: Surveillance of Infectious Diseases at Work (SIDAW) – Cases reported by consultants in communicable disease control (The University of Manchester 2019).

Occupational skin diseases

Information regarding incidence and prevalence of OSDs in the UK can be collated from different data sources.

The Labour Force Survey is currently the only source of reporting prevalence of OSD at any given time (HSE 2018a). It is important to clarify that the information regarding the prevalence of OSD is self-reported by the individuals who take part in the Labour Force Survey and not diagnosed and reported by a specialist doctor. Despite this fact, self-reported data concerning skin disease reported by the Labour Force Survey are valuable data, annually collected and analysed by the HSE. For the purposes of Study I the researcher reviewed and discussed data on incidence from THOR tables and data on prevalence from the Labour Force Survey tables (both publicly available on the HSE statistics database).

Statistics for OSD in the UK are based on a specific THOR scheme known as EPIDERM (which is funded by the HSE). Dermatologists record and report any new cases of OSD they have assessed since 1993. EPIDERM is the main database of THOR scheme which contains the largest numbers of reported cases of OSD in the UK. While severe cases are subject to under reporting, it remains the best available database with detailed analyses on occupational groups and causal agents (HSE 2018). General Practitioners (GPs) are also reporting new cases of OSD via a scheme called THOR-GP. Although the cases reported via THOR-GP are usually severe enough to have triggered a GP visit and resulted in diagnosis of work-related skin disease, the GP reporting of these cases is small in numbers; hence it cannot offer a precise estimation of work-related skin disease in the UK (HSE 2018).

The HSE publishes annually a report entitled 'Health and Safety Statistics. Annual report for Great Britain' where information regarding work-related ill health, workplace injuries, self-reported injuries as well as incidence and prevalence trends of occupational diseases are collated from various databases such as the Labour Force Survey (LFS), European Union Labour Force Survey (EU LFS) and the Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) (HSE 2011, HSE 2013, HSE 2014 and HSE 2015). Brief summaries regarding annual incidence trends of skin disorders are presented in the annual reports. More in-depth information, with regards to OSD in the UK was provided by the HSE in 2018. A report specific to skin diseases entitled 'Work-related skin disease in Great Britain, 2018' published by the HSE provided an overall scale of work-related skin diseases, trends in incidence and identification of high risk occupations and activities as well as work-related sickness absences and work-related ill health. The information in this report was collated from the data sources mentioned above, with each having different properties (reporting of incidence and/or prevalence), strengths and weaknesses as discussed above.

In order to be able to answer the research questions of Study I that concerned the national databases, the 2018 HSE report on work-related skin disease in Great Britain 2018 was reviewed and data available from EPIDERM THOR tables as well as the Labour Force Survey Work-related Illness-Type of illness tables were presented and discussed (HSE 2018b).

Population and sample

The national databases' population consisted of the UK's working population. For the purposes of Study I the sample of the national databases consisted of:

- new cases of any individual who has developed skin problems at the workplace as reported monthly from dermatologists and GPs on EPIDERM
- individuals in employment for the past 12 months who self-reported skin problems at work as reported by the Labour Force Survey. The selection of individuals for the purposes of the Labour Force Survey takes place at random from the Royal Mail's postcode Address File (Office for National Statistics 2019a and Office for National Statistics 2019b).

Inclusion Criteria

The inclusion criteria of the individuals reported on the national databases have been predetermined by the schemes. In order to identify data relevant to Study I, the researcher selected specific demographic characteristics of the individuals. Working age individuals with skin problems that were developed at work or were made worse by work between 2010 and 2015 (some of the available reports on the national databases extend before and after this six year period). Information regarding the demographics of these individuals were industry specific (e.g. healthcare, catering etc.) as per EPIDERM and Labour Force Survey reports available on HSE and the office of national statistics websites. Working age individuals were between the ages of 16 to 64, both male and female, working full or part-time (including temporary or permanent jobs) and even carrying out a second job (LFS 2019).

Exclusion Criteria

Individuals with any health problem other than skin (e.g. musculoskeletal problems).

Research Governance

Both the THOR/EPIDERM and Labour Force Survey tables were publically available on the HSE website, therefore no ethical approval was required to access the information on either these tables. The study was reviewed and approved by the School of Health Sciences Research Review Group (SHS/16/18) for purposes of rigour and research governance.

4.3.1.2 Local Database

OPAS (Warwick, version 2016.1.1 build 2016.1.1.54), was the specialised OHS software used in NHS Grampian OHS department during Study I. OPAS software is designed to record clinical event data (e.g. immunisation inputting, blood testing, nurse and medical assessment as well as health surveillance) and workflows and is able to be locally configured to OHS NHS Grampian. OPAS being an OHS specific software, however, unfortunately it was not linked with payroll or human resources departments and therefore did not represent accurately the numbers of all current/active NHS Grampian employees.

Population and sample

The population for this study consisted of NHS Grampian employees exposed to risk of wet work on annual basis during Study I. In order to determine the population numbers the researcher used the total number of active years in employment and total headcount within NHS Grampian as published by the Information Services Division (ISD), NHS National Services Scotland (Information Services Division Scotland, 2019a). The recorded numbers of NHS Grampian employees during the six year period included information about their occupational group which was very similar to the job family recorded on OPAS. A purposive sample was then selected from OPAS and consisted of:

(i) wet workers who had been under the OHS skin health surveillance scheme between 2010 to 2015 (inclusive) as well as

(ii) wet workers who had been referred (self and management referrals) to the OHS skin clinic during the same period of time.

Inclusion Criteria

The OPAS repeated cross-sectional study focused on employees who were considered to be wet workers as part of their day-to-day job. In order to determine which employees on OPAS fulfilled the above criterion, the researcher selected the employees based on the information available from their OPAS employment field which provided the following details: employment status (clinical or non-clinical), occupation (nurse, doctor, support services such as domestic, AHP), work type (acute, community), shift (12 and/or 8 hour shift). By using these identifiers on OPAS as well as setting date limits (01/01/2010 to 31/12/2015) the researcher was able to identify which of the employees would perform wet work as part of their day to day job.

The types of participants were wet workers employed by NHS Grampian. That included: registered and not registered nurses (i.e. auxiliary nurses), midwives, healthcare support workers (HCSWs), allied healthcare professionals, medical and dental staff, domestics, estates workers, administration and senior management.

Exclusion criteria

To avoid contamination of the preliminary data the following groups were excluded for the purposes of this study: bank staff, locum specialties, students (e.g. nursing, midwifery, health sciences, pharmacy, medical and dental), and non-clinical staff (e.g. drivers). Although some of these groups of employees were wet workers they were excluded from the study as the frequent and short-term rotation in various areas of work would prevent the researcher from identifying accurately high risk areas or other factors of OIHD prevalence for example, sufficient exposure to the hazard.

Research Governance

According to the NHS Health Research Authority guidance research on NHS staff does not require ethical approval from the UK's NHS Research Ethics Service (NHS Health Research Authority 2019). Approval from Research and Development (R&D) however, was required due to conducting research within the NHS. Approval for this study was granted by:

1. Robert Gordon University: School of Health Sciences Research Review Group (SRRG) with reference number: SHS/16/18 (appendix 4.1)

2. NHS Grampian Research and Development letter of permission following application in the Integrated Research Application System (IRAS) with reference number: 2017RG001 (appendix 4.2)
3. NHS Grampian Gatekeeper and Caldicott approval was granted from the NHS Grampian Head of Occupational Health and Safety, the OHS Nurse Manager and the Data Governance manager (appendices 4.3, 4.4 and 4.5)

4.3.2 Data Processing

4.3.2.1 National Databases

Procedure

As discussed earlier in this chapter a number of databases provide information about the incidence and prevalence of occupational skin disease in Great Britain. In order to answer the research questions of Study I that concerned the national databases the HSE '*Work-related skin disease in Great Britain'* annual reports from 2014, 2016, 2017 and 2018 were reviewed. The information contained in these reports are collated from EPIDERM and THOR GP. Data from EPIDERM and THOR-GP is analysed by a multidisciplinary team at the Centre for Occupational and Environmental Health, Manchester University. With regard to the data collated from the Labour Force Survey the HSE is solely responsible for data analysis. The HSE annual reports contain links to the excel tables with all data available from the databases mentioned above. The researcher reviewed the tables in order to answer the research questions concerning Study I. In-depth discussion takes place later in this chapter.

4.3.2.2 Local Database

Procedure

A repeated cross-sectional study of OPAS was conducted for each of the calendar years 2010 to 2015 (from 1st January to 31st December each year). Data was extracted from the OPAS server database via a SQL connection into Excel pivot tables and then converted to Excel sheets so that the format of the data could be then imported to IBM SPSS (Version 25) for further analysis. Data consisted of the wet worker's unique anonymous serial number, gender, age, occupation, area of work, department/zone as well as number of times the wet worker was recorded onto the annual OHS skin surveillance scheme between 01/01/2010 to 31/12/2015. The 'report runner' function in OPAS was used to select the first two episodes of the type 'skin surveillance' or 'skin referral' for export. Moreover, parameters and identifiers such as employment status, occupation, work type, business unit, and department were used to filter the export data according to the exclusion criteria. The process of extracting the data from OPAS via report runner was carried out with the assistance and presence of an OHS colleague who was specially trained to operate these SQL commands in the OPAS software. In that way the researcher minimised the potential for error when selecting the sample for the purposes of Study I.

Data Coding

In order to be able to examine the sample in more detail as well as to ascertain whether there are any significant differences concerning age groups and gender the researcher subdivided the sample into three categories (i) prevalence, (ii) incidence and (iii) referral cases. For statistical analysis and comprehensive presentation of the data as well as the wide age range of wet workers' ages (youngest 16 years old and oldest 70 years old), the researcher stratified the ages into age-groups as illustrated in figures 4.1-2 later in this chapter. The parameters which were selected during the primary data extraction from the OPAS database were the study's variables. The table below (4.1) illustrates the aggregated occupational groups:

Table 4.1 Occupational Groups Aggregated

Occupational Groups Aggregated
Medical Practitioner: MD Consultant, specialist registrar, associate specialist, speciality doctor, foundation house officer
General Practitioner: GP GP and GPST
Nursing/Midwifery (qualified and unqualified): NM Nurse, midwife, nurse assistant, auxiliary nurse, ancillary nurse, healthcare support worker, housekeeper
Medical Support: MS Theatre orderly
Administrative Services: AS Administration
Allied Health Professional: AHP Physiotherapist, occupational therapist, dietician, radiographer, podiatrist
Support Services: SS Porter, security, domestic, estates and maintenance, care assistant
Healthcare Sciences: HS Biomedical scientist, clinical scientist
Other Therapeutic Services: OTS Psychology, psychiatry, pharmacy
Dentist/Dental Support: DDS Dentist, dental officer, dental nurse, oral health
Pharmacist Pharmacist and pharmacy technician
Personal and Social Care Health coach
Senior Management: SM Clinical Researcher, general management services, nursing manager
Others Clinical Assistant, other support worker

In order to be able to explore the frequencies of the occupational groups who had declared pre-existing skin conditions a further aggregation of the occupational groups into four major categories was carried out as shown in table 4.2:

Table 4.2 Occupational Groups Further Aggregated

Occupational Groups Further Aggregated
Doctor and dentist Consultant, specialist registrar, associate specialist, speciality doctor, foundation house officer, GP and GPST, dentist, dental officer, dental nurse, oral health practitioner
Nursing/Midwifery (qualified and unqualified) Nurse, midwife, nurse assistant, auxiliary nurse, ancillary nurse, healthcare support worker, housekeeper
Other Clinical Physiotherapist, occupational therapist, dietician, radiographer, podiatrist, psychology, psychiatry, pharmacy, pharmacist and pharmacy technician.
Administration and Others Administration, clinical assistant, other support worker, porter, security, domestic, estates and maintenance, care assistant.

Similarly, the types of pre-existing skin conditions were further aggregated into five categories for the purposes of more efficient and comprehensive data analysis, including frequencies of the occupational groups during the six year period and cross tabulation tests. Such findings will be presented in tables and figures later in this chapter, where the aggregated groups allowed easy, clear and succinct interpretation. There were four core declarations of pre-existing skin conditions (dermatitis, eczema, latex allergy and psoriasis) which were pre-determined in the pre-placement health questionnaire of OHS NHS Grampian (all HCWs complete this health questionnaire on commencement of employment in NHS Grampian or every time they change jobs/posts within the organisation) which was reviewed by the researcher in order to collect and analyse the data. It is important to mention that although dermatitis and eczema represent the same condition and these two terms can be used interchangeably (chapter 1, page 17) in the pre-placement health questionnaires, they have been categorised separately. The two declarations (dermatitis and eczema) were merged into one category for the purposes of analysis in this study. Table 4.3 illustrates the new standard declaration categories:

Table 4.3 Standard Declarations of pre-existing skin conditions

1	Dermatitis/Eczema
2	Latex Allergy
3	Psoriasis
4	Combined/Other (includes all the declared combinations of the above three conditions in this sample)
5	No declaration

Data Cleaning

Once the data was imported into SPSS, data cleaning took place for the elimination of possible errors. These could include missing values, range checks, skips and checks for inconsistency. None were identified.

Missing data

There are typically two types of missing values:

(i) when a question has been left deliberately blank/unanswered
(ii) when a reply was expected but not given, also known as an inadequate response (Bowling 2014).

Neither of these types of missing values were identified during the OHS database survey due to the nature of the data collected.

4.3.3 Data analysis

National and Local/Regional Databases

In order to be able to ascertain the prevalence of OIHD on a national level, the researcher used descriptive statistics. Depending on the type of data, the appropriate measures were reported. The frequency distribution of the sample was examined (mean and median, the averages as well as the standard deviation), to assess and report the demographics (age, gender, occupational groups).

With the view to explore any significant associations between development of OIHD and occupation, age, gender, area of work, pre-existing skin condition, no pre-existing skin condition the researcher used cross-tabulations. P-values less than 0.05 were deemed as significant.

4.3.4 Results

4.3.4.1 National Databases

The HSE commissions annual questions in the Labour Force Survey in order to survey work-related illness and workplace injury based on individuals' perceptions. As aforementioned, the analysis of these data presented in the tables is the sole responsibility of the HSE. Another point of clarification vis-à-vis time periods of the available data (for skin problems) which were reviewed in the annual reports from THOR and Labour Force Survey: the estimated numbers of cases in the published annual reports are usually shown/presented on a three or ten yearly average period. As a result, these time periods do not always correspond with the time period (2010 to 2015) that the researcher reviewed for the regional database. Despite having non-exact corresponding time periods between the national and regional data sources, the reported findings of incidence and prevalence cases remain of high relevance, offer valuable insights and enable reflection and critical discussion later on in this chapter.

Research Question (i)

What is the reported national prevalence of OIHD for wet workers between 2010 and 2015 (period prevalence for each of the six years)?

In order to be able to answer the first research question, the 2017 HSE report on work-related skin disease in Great Britain was reviewed. Statistics presented in Tables 4.4 and 4.5 are derived from the Labour Force Survey Work-related Illness - Type of illness (LFSILLTYP) tables (HSE 2018b). Table 4.4 presents the annual estimates of the total number of individuals with self-reported skin problems which were caused by or made worse by work in the past 12 months. The Labour Force Survey figures do not provide information on which occupations are mostly affected with work-related skin disease.

Table 4.4 Estimated prevalence for skin issues – annual average results

	Estimated Prevalence (in thousands)		Rate per 100,000 employed in the past 12 months		Whether rates statistically significantly higher/lower than previous period
		95% CI (upper and lower bounds)		95% CI (upper and lower bounds)	
2009/2010	**22**	(14 -30)	**75**	(48-100)	No numbers
2010/2011	▪	▪	▪	▪	▪
2011/2012	**15**	(8-22)	**50**	(28-71)	▪
2013/2014	▪	▪	▪	▪	▪
2014/2015	**20**	(12-27)	**61**	(37-86)	▪
2015/2016	**18**	(10-25)	**54**	(30-78)	No numbers

Footnote: ▪ Sample numbers are too small to provide reliable estimates.

The Labour Force Survey figures for the annual prevalence of self-reported skin issues although they appear to fluctuate in the period between 2010 to 2015 they have been overall flat in the past decade (2007 to 2017) according to the HSE 'Work-related skin disease in Great Britain, 2018' report (HSE 2018b). During the years 2010/2011 as well as 2013/2014 the sample numbers were too small to provide reliable numbers therefore they have not been presented in the Labour Force Survey figures. The annual rates show no statistically significant differences between each year.

Table 4.5 presents the three-year average results of self-reported skin issues in the UK. The estimated incidence figures also remain small when looked at lengthier periods of time and present no statistically significant differences between each year (from 2007 to 2017).

Table 4.5 Estimated incidence of skin issues - three year average results

	Estimated Incidence (in thousands)		**Rate per 100,000 employed in the past 12 months**		**Whether rates statistically significantly higher/lower than previous period**
		95% CI (upper and lower bounds)		**95% CI (upper and lower bounds)**	
2007/08, 2009/10	**9**	(6-12)	**31**	(21-41)	No
2010/11, 2011/12	·	▪	▪	▪	▪
2013/14	**5**	(3-7)	**17**	(10-24)	Lower numbers
2014/15, 2016/17	**6**	(4-9)	**19**	(11-28)	No numbers

Footnote: ▪ Sample numbers are too small to provide reliable estimates.

▪▪ Annual only as the three yearly incidence estimation was missing from the database.

Research Question (ii)

Which are the work groups/occupations of wet workers affected the most?

Data available from EPIDERM during the 2001-2017 period illustrate significant variations in incidence rates of occupational dermatitis amongst the major occupational groupings (THORS04 2018). For example, the groups 'Managers, Directors and Senior Officials' as well as 'Administrative and Secretarial Occupations' showed the lowest incidence rates (1.1 and 0.4 cases per 100,000 workers per year between 2008-2017) (HSE 2018a). Groups with much higher incidence rates (9.9 and 7.5) were the 'Caring, Leisure and Other Service Occupations' and 'Skilled Trades Occupations' respectively. High incidence is defined as >25 incidents per 100,000 workers per year (HSE 2018a). Within the occupation unit groups, smaller numbers of reported cases occurred. However, it is important to mention that some occupations had higher rates of occupational skin disease than other occupations in the major groupings of occupations (HSE 2018a). The five occupations with higher rates within the period 2008-2017 as reported on the 2018 annual HSE report were:

-florists (76.7 cases per 100,000 workers per year),

-hairdressers and barbers (67.5 cases per 100,000 workers per year),

-cooks (62.9 cases per 100,000 workers per year),

-beauticians (69.9 cases per 100,000 workers per year), and

-metal working machine operatives (43.7 cases per 100,000 workers per year) (HSE 2018a).

Other occupations with high incidence rates included dental practitioners, nurses, moulders, die casters and core makers (HSE 2018a). More specifically the reported cases of contact dermatitis by occupation in healthcare industries as reported by dermatologists on EPIDERM are illustrated in table 4.6. The healthcare professions mostly affected in the 10 year period 2006 to 2015 are nurses/auxiliaries/nursery nurses/assistants as well as medical practitioners and AHP (e.g. physiotherapists, occupational therapists, podiatrists, radiographers) (THORS04 2018). Moreover, the figure for nurses in the period 2013-2015 is lower than that of 2010-2012, however, the opposite is noticed for the nursing auxiliaries and assistants during the same periods. Although there was no available information regarding these figures factors such as staffing levels and/or sickness absence may have been contributory to these observations.

Table 4.6 Estimated number of contact dermatitis cases reported by dermatologists to EPIDERM by occupation

Average annual estimates over 3 year and 10 year periods, with rate per 100,000 workers in brackets			
	2010-2012	**2013-2015**	**2006-2015**
Occupations			
Nurses	180	126	164
Midwives	5	No number	6
Nursery nurses and assistants	4	13	9
Nursing auxiliaries and assistants	29	44	32
Medical practitioners	37	30	29
Podiatrists	▪	▪	3
Physiotherapists	12	▪	6
Occupational Therapists	▪	▪	2
Medical Radiographers	4	▪	4
Pharmacists	▪	▪	1
Laboratory technicians	20	9	13

Footnote: ▪ Sample numbers are too small to provide reliable estimates.

4.3.4.2 Local Database

Research Question (iii)

What is the annual incidence and prevalence of OIHD between 2010 and 2015 (period prevalence for each of the five years)?

The OPAS sample (N=917) consisted of wet workers recorded on the OHS surveillance scheme including new and existing (annual recall) cases as well as referral cases (self and/or management referrals) with skin issues developed or made worse at the workplace. Figures 4.1 and 4.2 illustrate a snapshot of the of the total OPAS sample's demographics (age and gender) in 2016 which is the year after the end of the six year surveillance period (2010 to 2015). The reason for calculating the age and/or gender of the sample in 2016, was that if calculated at any other point during the six year surveillance period, it would not have captured all the wet workers as some would have entered the surveillance in different time-points. In 2016, the average age of the OPAS sample was 39 years of age. Figure 4.2 illustrates the age ranges of the total sample and it is evident that there are two major age groupings; i) twenties to forties and ii) forties to sixties. Gender split was 89% female and 11% male which is consistent with the Grampian's workforce profile as of March 2016 with 83% female and 17% male staff in post (NHS Grampian 2016). Demographics regarding occupational groups and the presence or absence of pre-existing skin conditions of the sample are being explored within three separate groups and are explained below.

Figure 4.1 Gender Distribution

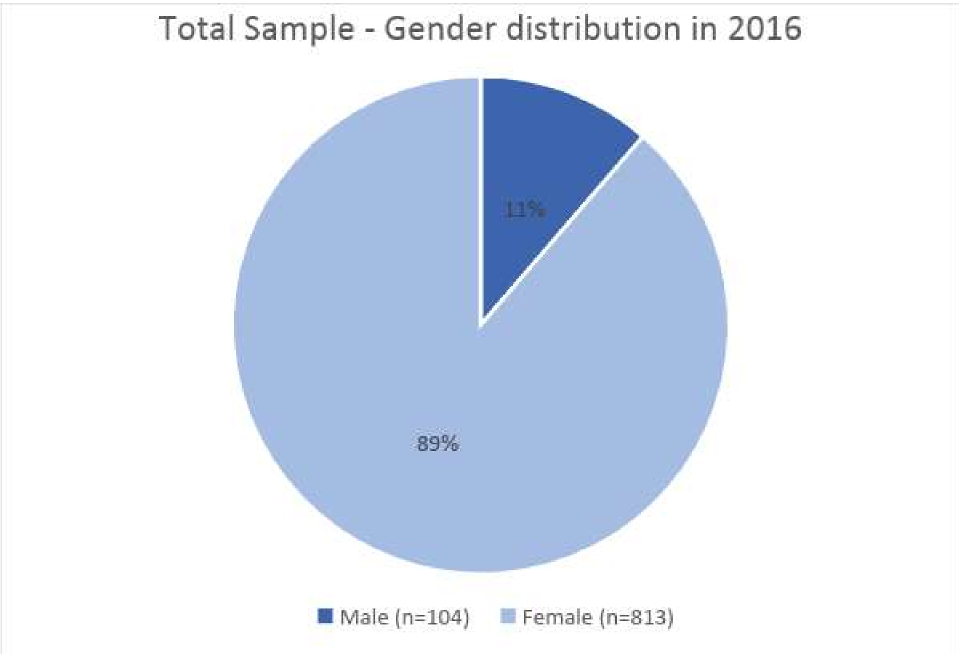
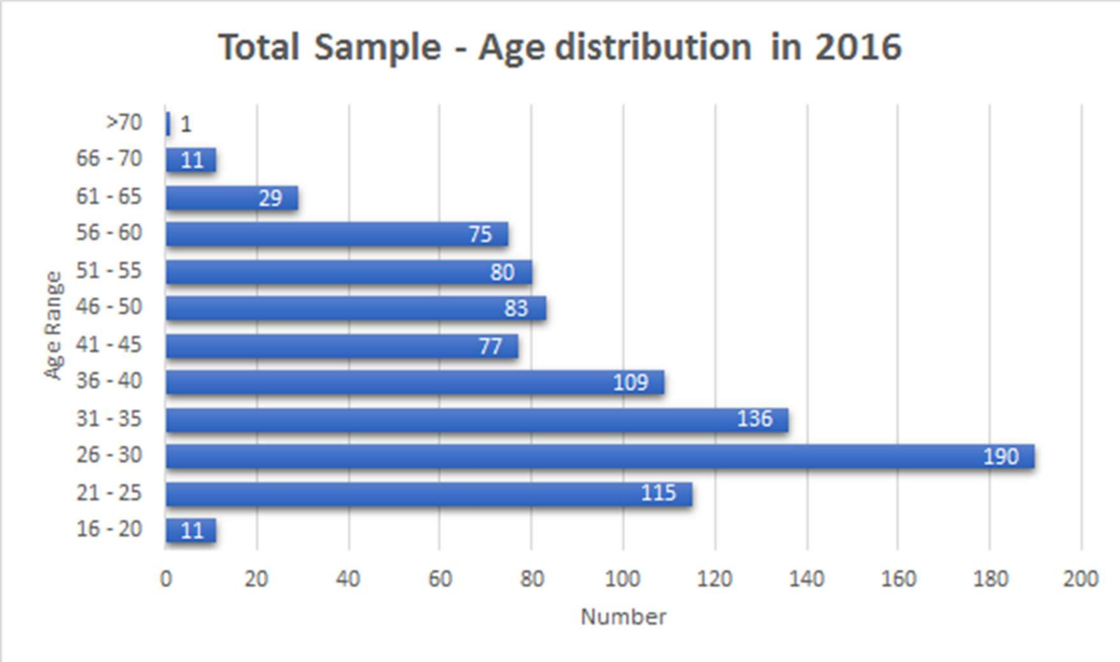


Figure 4.2 Age distribution



In order to be able to address research question (i) the researcher divided OPAS sample into the following three groups:

- All Surveillance Cases: new and existing/recall surveillance cases each year
- New Surveillance Cases: new cases entering surveillance each year
- Referral Cases: self and or management referral cases each year

Table 4.7 summarises the prevalence, incidence, period prevalence and incidence rate for each of the year period 2010 to 2015 and is further discussed below.

Table 4.7 Prevalence and Incidence summary table for NHS Grampian wet workers

	2010	2011	2012	2013	2014	2015
Prevalence (All Surveillance Cases)	168	187	369	204	343	487
Incidence (New Surveillance Cases)	102	107	131	148	178	157
Referral Cases	63	23	74	10	12	36
Referrals as % of All Surveillance Cases	37.5%	12.3%	20.1%	4.9%	3.5%	7.4%
NHS Grampian Total Headcount **Source: Information Services Division Scotland**	15073	13932	13950	14037	14299	14533
Period Prevalence	1.11%	1.34%	2.65%	1.45%	2.40%	3.35%
Incidence Rate	0.68%	0.77%	0.94%	1.05%	1.24%	1.08%

- ***<u>All Surveillance Cases: Prevalence between 2010 and 2015</u>***

The total numbers of all the recorded health surveillance cases (new and existing cases) during the six year period of interest appear to gradually increase every year apart from 2013 where it drops. An influx of cases is observed in 2012, while in 2013 the total numbers drop. In 2012 a new brand/type of the examination rubber gloves was introduced throughout the NHS Grampian. During the period the new gloves were introduced, an influx of the number of wet workers entering the OHS surveillance scheme has been observed. The following year, while it would have been expected to observe similarly increased numbers there was actually a decrease in the total prevalence number. This event might be due to a concurring OPAS system error that occurred during that period observed by the researcher. At the time of the system error, some of the surveillance cases were accidentally removed from the 2012 annual recall. As a result, fewer cases were followed-up in 2013 but they were recalled the year after (2014). Interpretation and discussion of the above observations is carried out in the discussion section of this chapter.

- ***New Surveillance Cases: Incidence between 2010 and 2015***

The new surveillance cases present an overall gradual increase of total numbers each year with a distinctive influx of new cases in 2012 as observed in all surveillance and management referral cases in 2012. These cases have either been escalated following health surveillance screening by an OHS nurse or they have been referred to OHS either by themselves or by the line manager. While the total, per annum numbers of referral cases are smaller compared to all surveillance cases as well as compared to the new surveillance cases, a similar influx pattern is being noticed in 2012 (table 4.7).

- ***Referral Cases between 2010 and 2015***

The total number of referral cases between 2010 and 2015 represents cases which required to be assessed by an OHS adviser or physician. The referral cases as a percentage of all the surveillance cases appear to decrease during the five year period. This may indicate that the severe cases of wet workers with OIHD are few as well as that the less severe cases can be resolved or controlled during health surveillance assessments and do not require escalation.

Research Question (iv)

What is the profile of wet workers reported in the OHS OPAS database (e.g. age, gender, area of work, type of occupation, pre-existing/underlying skin conditions)?

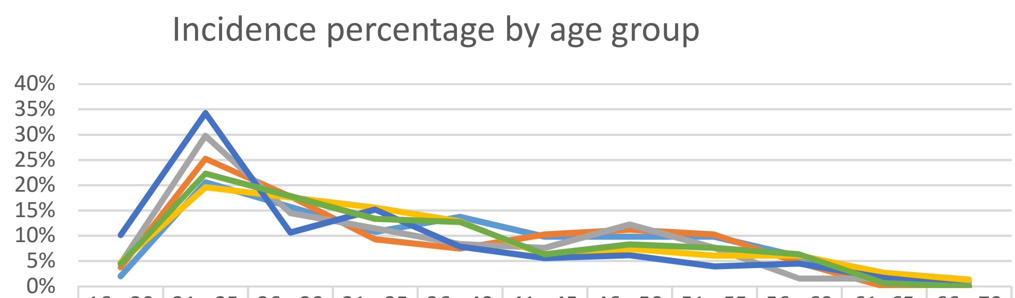
Demographics

The demographics from the OPAS database included the age, gender, occupational groups, wet workers with pre-existing skin conditions and types of pre-existing skin conditions during the six year period (2010 to 2015).

Age

The numbers of NHS Grampian wet workers in each age group affected by OIHD during the six year period of interest are presented in figures 4.3-4.4. Wet workers between the age groups 21 to 25, 26 to 30 and 31 to 35 years old in both figures 4.3 and 4.4 appear to be the most affected by OIHD and as the age groups increase in years the numbers of wet workers affected drop; therefore, it would appear that younger people are mainly affected by OIHD. According to the annual NHS Grampian Workforce Plan reports, the average age of the workforce from 2010 to 2015 has been consistently over the age of 40 and more specifically; in 2010 it was reported to be over 40 years, in 2011 and 2012 it was recorded between 45 and 49 years of age and between 2013 to 2015 it was 43 years (NHS Grampian 2010, NHS Grampian 2011, NHS Grampian 2012, NHS Grampian 2013, NHS Grampian 2014 and NHS Grampian 2015).

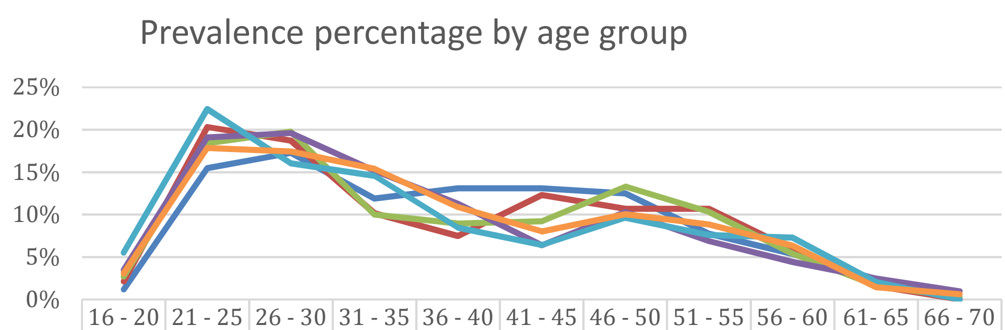
Figure 4.3



	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61- 65	66 - 70
2010 (n=102)	2%	21%	16%	11%	14%	10%	10%	10%	6%	2%	0%
2011 (n=107)	4%	25%	18%	9%	7%	10%	11%	10%	5%	0%	0%
2012 (n=131)	5%	30%	15%	11%	8%	8%	12%	8%	2%	2%	1%
2013 (n=148)	5%	20%	18%	16%	13%	6%	7%	6%	6%	3%	1%
2014 (n=178)	10%	34%	11%	15%	8%	6%	6%	4%	4%	2%	0%
2015 (n=157)	4%	22%	18%	13%	13%	6%	8%	8%	6%	1%	0%

Age groups

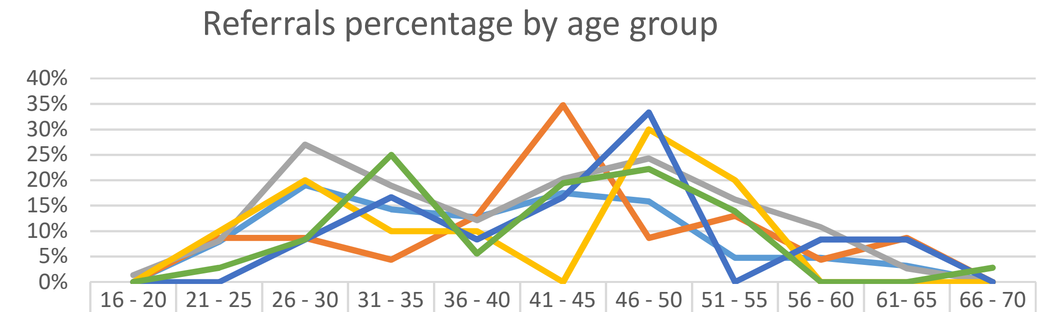
Figure 4.4



	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61 - 65	66 - 70
2010 (n=168)	1%	15%	17%	12%	13%	13%	13%	8%	5%	2%	0%
2011 (n=187)	2%	20%	19%	10%	7%	12%	11%	11%	6%	2%	0%
2012 (n=369)	3%	18%	20%	10%	9%	9%	13%	10%	5%	2%	0%
2013 (n=204)	3%	19%	20%	15%	11%	6%	10%	7%	4%	2%	1%
2014 (n=343)	6%	22%	16%	15%	8%	6%	10%	8%	7%	2%	0%
2015 (n=487)	3%	18%	17%	15%	11%	8%	10%	9%	6%	1%	1%

Age groups

Figure 4.5



	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61- 65	66 - 70
2010 (n=63)	0%	8%	19%	14%	13%	17%	16%	5%	5%	3%	0%
2011 (n=23)	0%	9%	9%	4%	13%	35%	9%	13%	4%	9%	0%
2012 (n=74)	1%	8%	27%	19%	12%	20%	24%	16%	11%	3%	0%
2013 (n=10)	0%	10%	20%	10%	10%	0%	30%	20%	0%	0%	0%
2014 (n=12)	0%	0%	8%	17%	8%	17%	33%	0%	8%	8%	0%
2015 (n=36)	0%	3%	8%	25%	6%	19%	22%	14%	0%	0%	3%

Age groups

The numbers of the referral cases of NHS Grampian wet workers in each age group are illustrated in figure 4.5. During 2011, 2013 and 2014, wet workers who belonged in older age groups (between 41 and 50 years of age) appear to be distinct. In contrast to the findings of the age groups in the prevalence and incidence figures 4.3 and 4.4 where it appeared that younger individuals are affected more by OIHD, here such observations cannot be made due to the variability of the proportions within all age groups that is being noticed. Such observation, may be attributed to the small numbers of the referral cases annually.

Table 4.8 offers a summary of the age mean and the standard deviation in each of the three groups (prevalence, incidence and referral cases). Existing and new cases reported onto the local surveillance scheme consist of wet workers in their 30s whereas the referral cases age means indicate that more severe OIHD affects slightly older employees (late 30s and 40s); however, this statement is subject to the small numbers reported as mentioned previously. It is not possible to ascertain or conclude within this small sample whether the average age differences observed across the three groups are of significance as to which age ranges may be more affected by OIHS at work, since the standard deviation (11 and 12 years) is large and, therefore, the ages spread out over a wider range of values (Field 2015).

Table 4.8 Age means

	Prevalence Cases		Incidence Cases		Referral Cases	
	Age Mean	Standard Deviation	Age Mean	Standard Deviation	Age Mean	Standard Deviation
2010	38	11	37	12	39	11
2011	37	12	35	12	43	11
2012	37	12	34	12	41	11
2013	36	12	36	12	40	11
2014	36	12	32	12	45	11
2015	37	12	35	12	42	10

Gender

According to the 2011 Census, in NHS Grampian there were approximately equal numbers of males (49.5 %) and females (50.5%) (NHS Grampian 2016). NHS Grampian, however, is a female dominated organisation due to the fact that the majority of employees are nurses/midwives and AHPs which have traditionally been female professions. Figures 4.6-8 illustrate the gender distribution in the three groups (prevalence, incidence and referral cases) and confirm that female workers are dominant in all three groups. In all three figures (4.6-8) the bar labels represent numbers of cases.

Figure 4.6

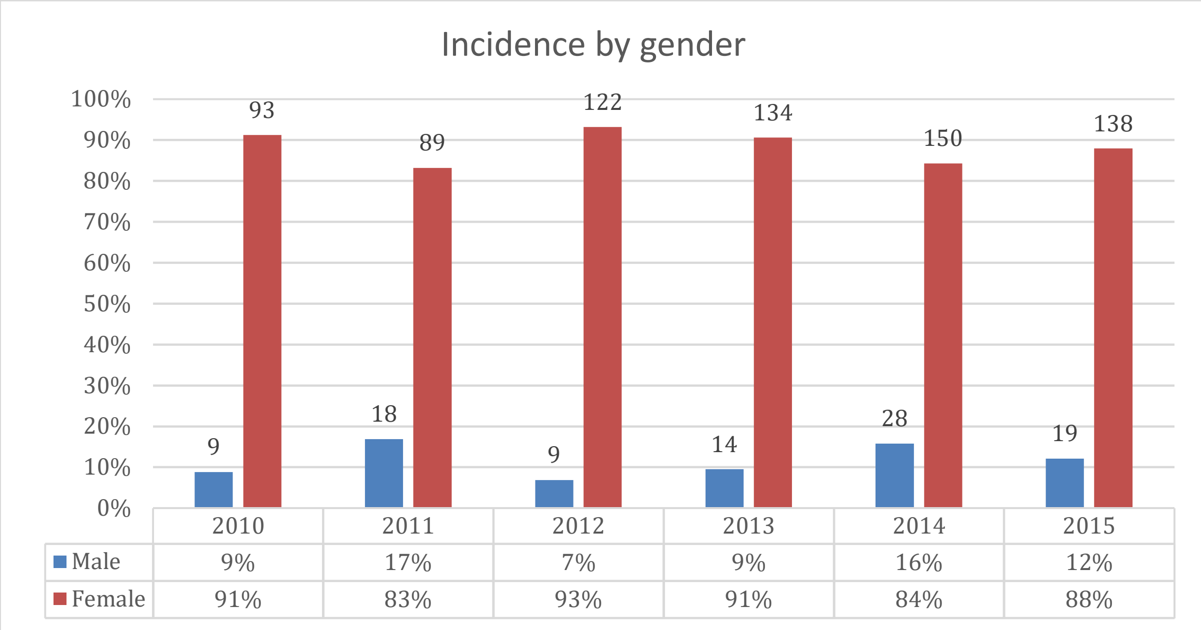


Figure 4.7

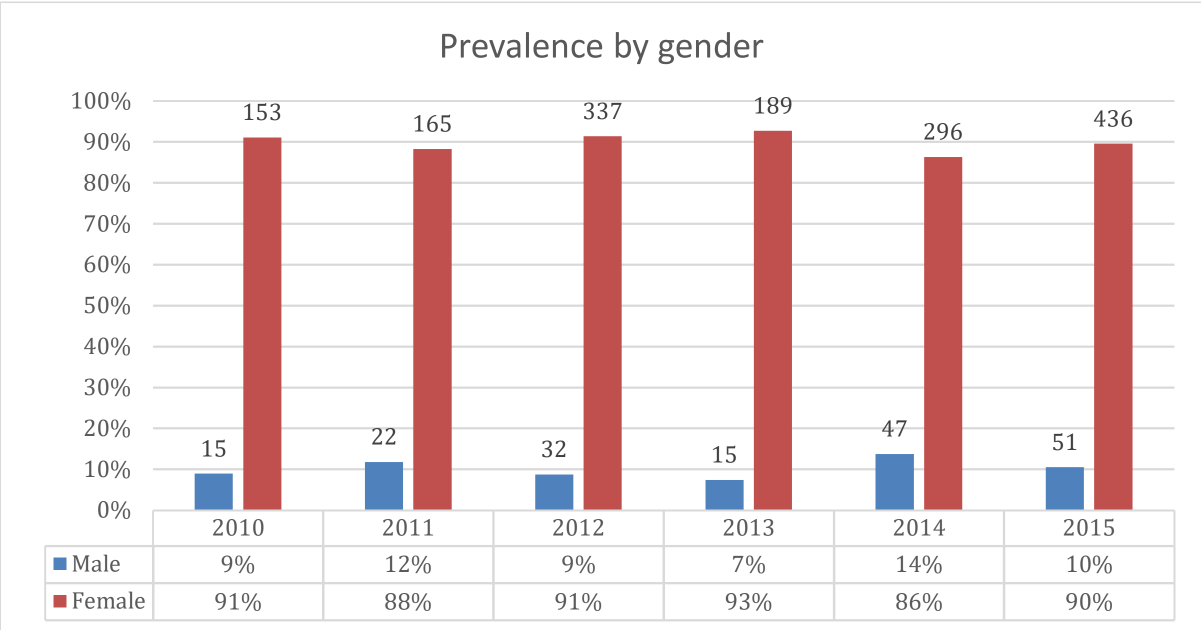
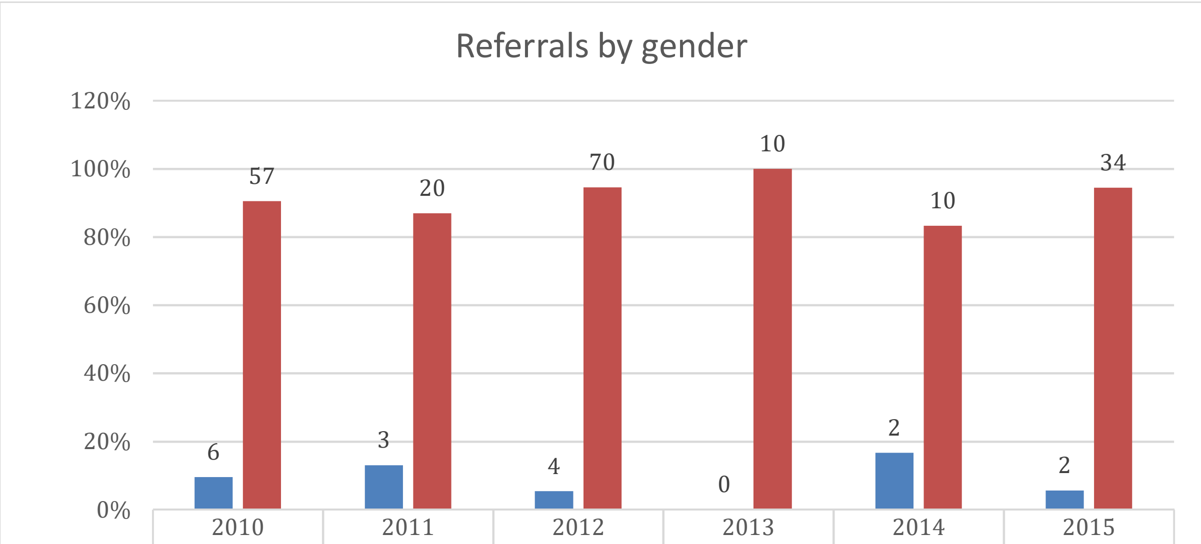


Figure 4.8



	2010	2011	2012	2013	2014	2015
Male	10%	13%	5%	0%	17%	6%
Female	90%	87%	95%	100%	83%	94%

Occupational groups

Figures 4.9, 4.10 and 4.11 illustrate the occupational groups affected by OIHD during the period 2010-2015. The bar labels in all the charts represent numbers of cases.

Incidence by occupational group

The two major groupings of occupations in incidence category are the 'Nursing/Midwifery' and 'Medical Practitioner' groups (figure 4.9). The groups 'Personal and Social Care' (one case in the six year period) and 'Healthcare Sciences' (two cases in the six year period) have the lowest incidence rates of OIHD. It is evident that the two most affected occupational groups consist of the majority of the wet workers within this sample. It is important to acknowledge the fact that all the new cases (incidence) recorded in the OHS skin surveillance scheme during the period 2010-2015 have entered the scheme either voluntarily, or via a management referral.

Prevalence by occupational group

Figure 4.10 shows the prevalence of OIHD by occupational grouping during 2010-2015. Similar patterns to that of the incidence category also appear here. Nursing/Midwifery' and 'Medical Practitioner' groups are the occupational groups with the highest rates, while the occupational groups with the lowest rates are the 'Personal and Social Care' (one case in the six year period) and 'Healthcare Sciences' (three cases in the six year period) respectively. Other occupational groupings with high prevalence rates are the 'Administrative Services', 'Allied Health Professionals' and 'Support Services'.

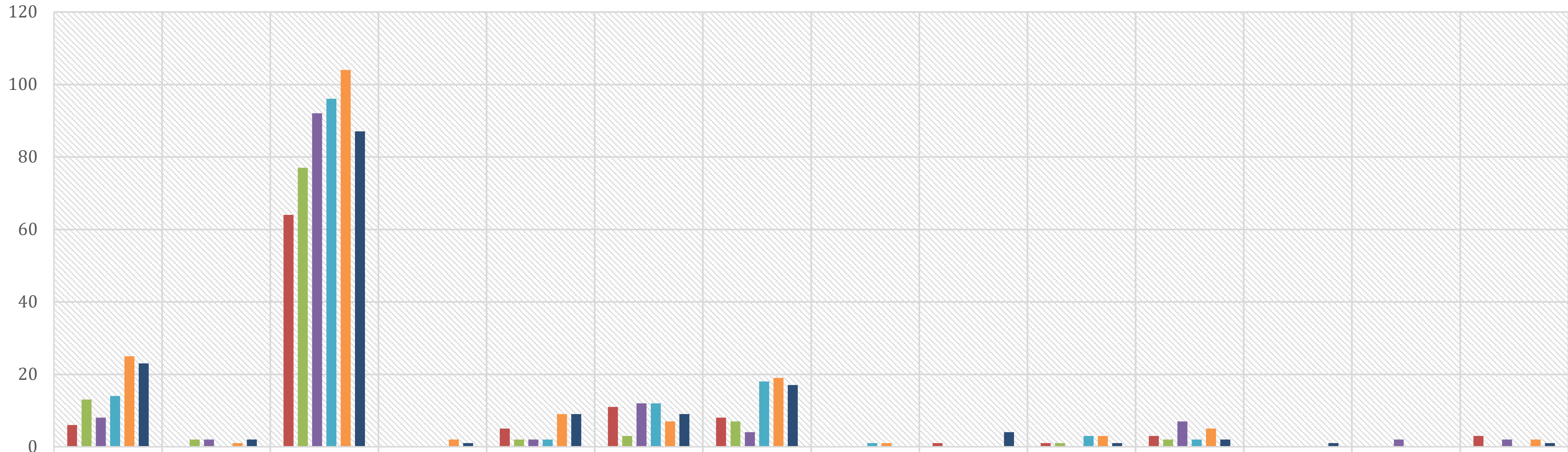
Referral Cases by occupational group

Figure 4.11 illustrates the referral cases during 2010-2015 by occupational groups. Work-related skin disease affects mostly nurses, midwives, radiographers, nursing assistants and auxiliaries as well as medical practitioners and allied health professionals such as physiotherapists (HSE 2018c). The numbers in this category are small compared to the incidence and prevalence categories. It is, therefore, not possible to ascertain whether the 'Nursing/Midwifery' occupational group is the only or even main group where wet workers develop severe OIHD and require further assessment and follow-up by OHS specialists (OH doctor or nurse adviser). Further interpretation of these numbers is subject to considerable statistical uncertainty due to the small numbers of referral cases during the period 2010-2015.

As mentioned previously, if statutory surveillance applied to every wet worker in the organisation, there would be a more accurate indicator of which occupational groupings maybe more prone in developing severe OIHD; caution, therefore, must be applied when interpreting the results of the OPAS database.

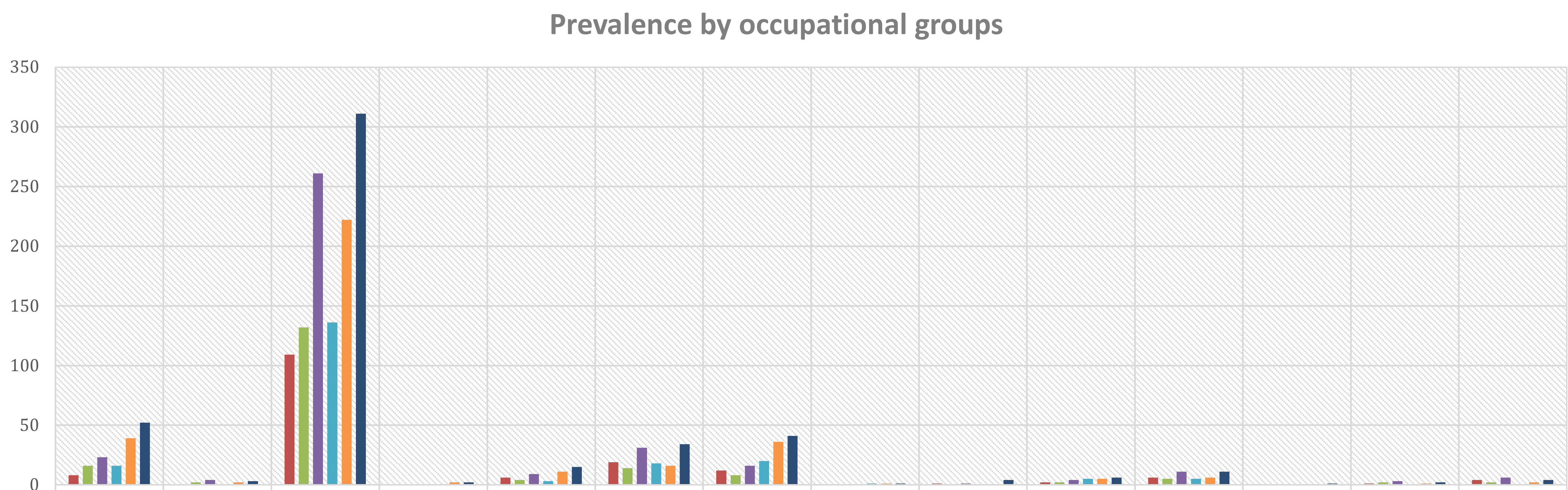
Figure 4.9

Incidence by occupational groups



	MEDICAL PRACTITIONER	GENERAL PRACTITIONER	NURSING / MIDWIFERY	MEDICAL SUPPORT	ADMINISTRATIVE SERVICES	ALLIED HEALTH PROFESSIONALS	SUPPORT SERVICES	HEALTHCARE SCIENCES	OTHER THERAPEUTIC SERVICES	PHARMACISTS	DENTISTS / DENTAL SUPPORT	PERSONAL AND SOCIAL CARE	SENIOR MANAGEMENT	OTHERS
2010	6	0	64	0	5	11	8	0	1	1	3	0	0	3
2011	13	2	77	0	2	3	7	0	0	1	2	0	0	0
2012	8	2	92	0	2	12	4	0	0	0	7	0	2	2
2013	14	0	96	0	2	12	18	1	0	3	2	0	0	0
2014	25	1	104	2	9	7	19	1	0	3	5	0	0	2
2015	23	2	87	1	9	9	17	0	4	1	2	1	0	1

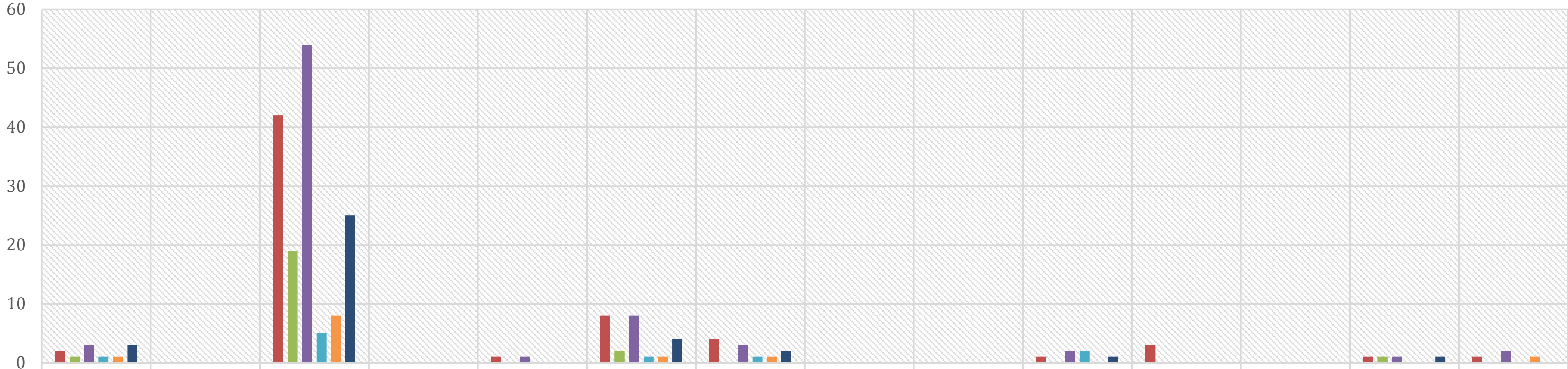
Figure 4.10



	MEDICAL PRACTITIONER	GENERAL PRACTITIONER	NURSING / MIDWIFERY	MEDICAL SUPPORT	ADMINISTRATIVE SERVICES	ALLIED HEALTH PROFESSIONALS	SUPPORT SERVICES	HEALTHCARE SCIENCES	OTHER THERAPEUTIC SERVICES	PHARMACISTS	DENTISTS / DENTAL SUPPORT	PERSONAL AND SOCIAL CARE	SENIOR MANAGEMENT	OTHERS
2010	8	0	109	0	6	19	12	0	1	2	6	0	1	4
2011	16	2	132	0	4	14	8	0	0	2	5	0	2	2
2012	23	4	261	0	9	31	16	0	1	4	11	0	3	6
2013	16	0	136	0	3	18	20	1	0	5	5	0	0	0
2014	39	2	222	2	11	16	36	1	0	5	6	0	1	2
2015	52	3	311	2	15	34	41	1	4	6	11	1	2	4

Figure 4.11

Referrals by occupational groups



	MEDICAL PRACTITIONER	GENERAL PRACTITIONER	NURSING / MIDWIFERY	MEDICAL SUPPORT	ADMINISTRATIVE SERVICES	ALLIED HEALTH PROFESSIONALS	SUPPORT SERVICES	HEALTHCARE SCIENCES	OTHER THERAPEUTIC SERVICES	PHARMACISTS	DENTISTS / DENTAL SUPPORT	PERSONAL AND SOCIAL CARE	SENIOR MANAGEMENT	OTHERS
2010	2	0	42	0	1	8	4	0	0	1	3	0	1	1
2011	1	0	19	0	0	2	0	0	0	0	0	0	1	0
2012	3	0	54	0	1	8	3	0	0	2	0	0	1	2
2013	1	0	5	0	0	1	1	0	0	2	0	0	0	0
2014	1	0	8	0	0	1	1	0	0	0	0	0	0	1
2015	3	0	25	0	0	4	2	0	0	1	0	0	1	0

Pre-Existing Skin Conditions

Figures 4.12-14 in the section below, show the wet workers who have self-declared pre-existing skin conditions prior to entering the OHS skin surveillance scheme during 2010-2015. When NHS Grampian employees are made a conditional offer to work in NHS Grampian (this includes employees new to the organisation as well as existing employees who change jobs/roles within NHS Grampian) they are asked by OHS to fill in and submit a pre-placement health questionnaire. Skin-specific questions are contained in the pre-placement health questionnaire and they relate to whether or not the employees have had any pre-existing skin conditions. This information (pre-placement health questionnaires) was available from the wet workers' OHS records. The researcher reviewed all 917 records individually to identify whether the wet workers had declared in their pre-placement health questionnaires any pre-existing skin conditions. The figures are once more categorised into three groups; incidence, prevalence and referral cases. The figures illustrate how many wet workers have declared or not pre-existing skin conditions ("yes" or "no") as well as the missing records (no pre-placement health questionnaire available on the wet workers' OHS record, possibly attributed to human/administrative error, e.g. deletion of a record by mistake).

Figure 4.12 shows the incidence cases by pre-existing skin condition declarations. In years 2011 ("yes" 46, "no" 55) and 2013 ("yes" 71, "no" 74) the majority of the new cases of wet workers who entered the annual OHS skin surveillance scheme had no pre-existing skin conditions. For the years 2010, 2012, 2014 and 2015, the new cases of wet workers with pre-existing skin conditions were the majority compared to the wet workers who declared no pre-existing skin conditions. It is important to mention that the difference in total numbers of the new wet workers, with and without pre-existing declarations, were minor. However, it appears that wet workers with pre-existing skin conditions are more likely to enter the surveillance scheme either because wet work has triggered OIHD (new symptoms), or because it has made the pre-existing skin condition worse. Due to limited access on the wet worker's medical records (OHS records are separate from GP records for data protection purposes) it is not possible to ascertain which the case is. Another observation is that the total numbers of new cases gradually increase during the six year period.

Missing records (containing information about pre-existing skin conditions from the pre-employment health questionnaires of the wet workers) occur in each year during the six year period, with minor fluctuations in numbers. Missing records are usually subject to human error for example, misfiling or accidentally destroying a record. The researcher identified the missing records by manual, one by one search of the individuals' scanned records in OPAS. Although this sample does not consist of the whole NHS Grampian population at risk of exposure to wet work, the results provide valuable information.

Figure 4.12

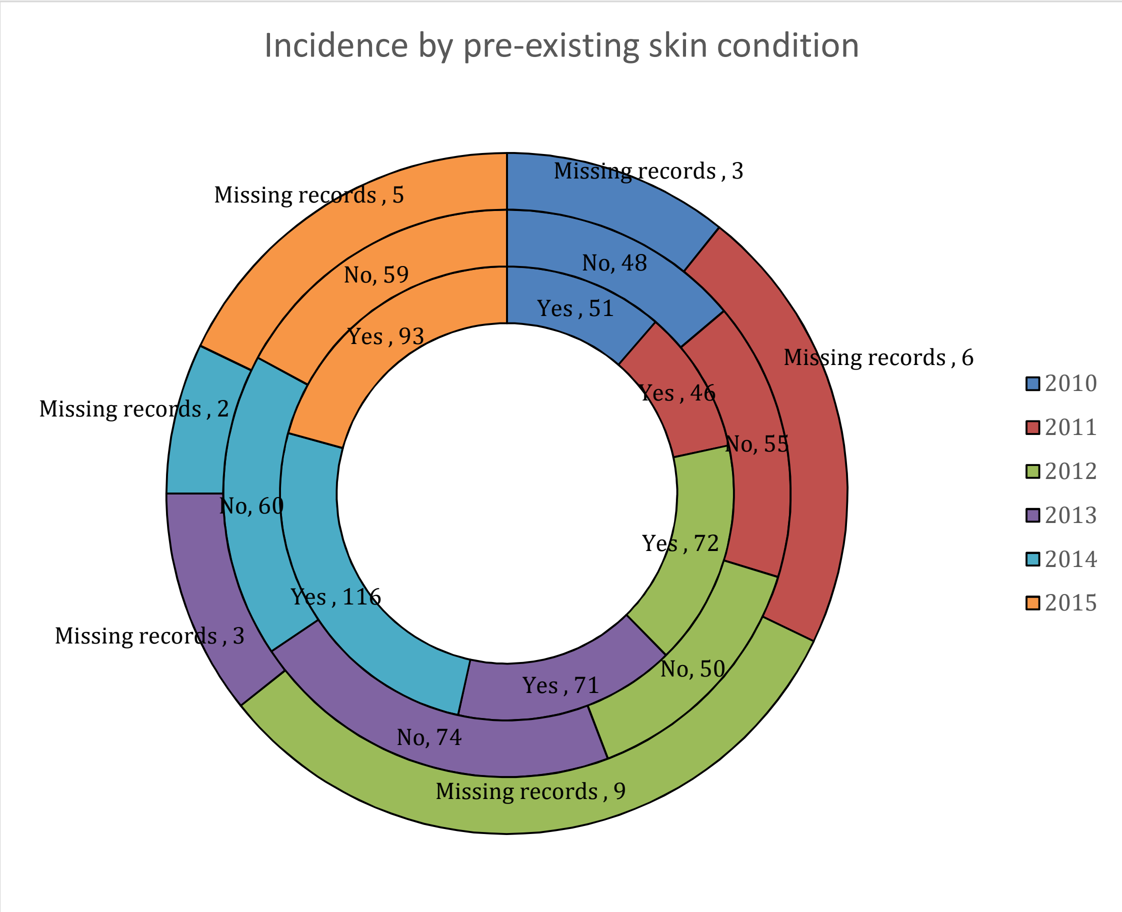


Figure 4.13 illustrates the prevalence cases by pre-existing skin condition. In most of the years during the six year period (apart from 2011 and 2013 with small differences between declared and not declared pre-existing skin conditions; year 2011: "yes" 89, "no" 90) the wet workers who have declared having pre-existing skin conditions were the majority. Despite the fact that all cases (prevalence group) on the OHS skin surveillance consist of wet workers with pre-

existing skin conditions it is important to take into consideration the fact that the differences in numbers between the wet workers who declared pre-existing skin conditions and those who did not, were small (except year 2015; “yes” 281, “no” 189). It is also important to keep in mind the fact that pre-existing skin conditions were self-declared by the wet workers, therefore, any conclusions should be drawn with caution.

Figure 4.13

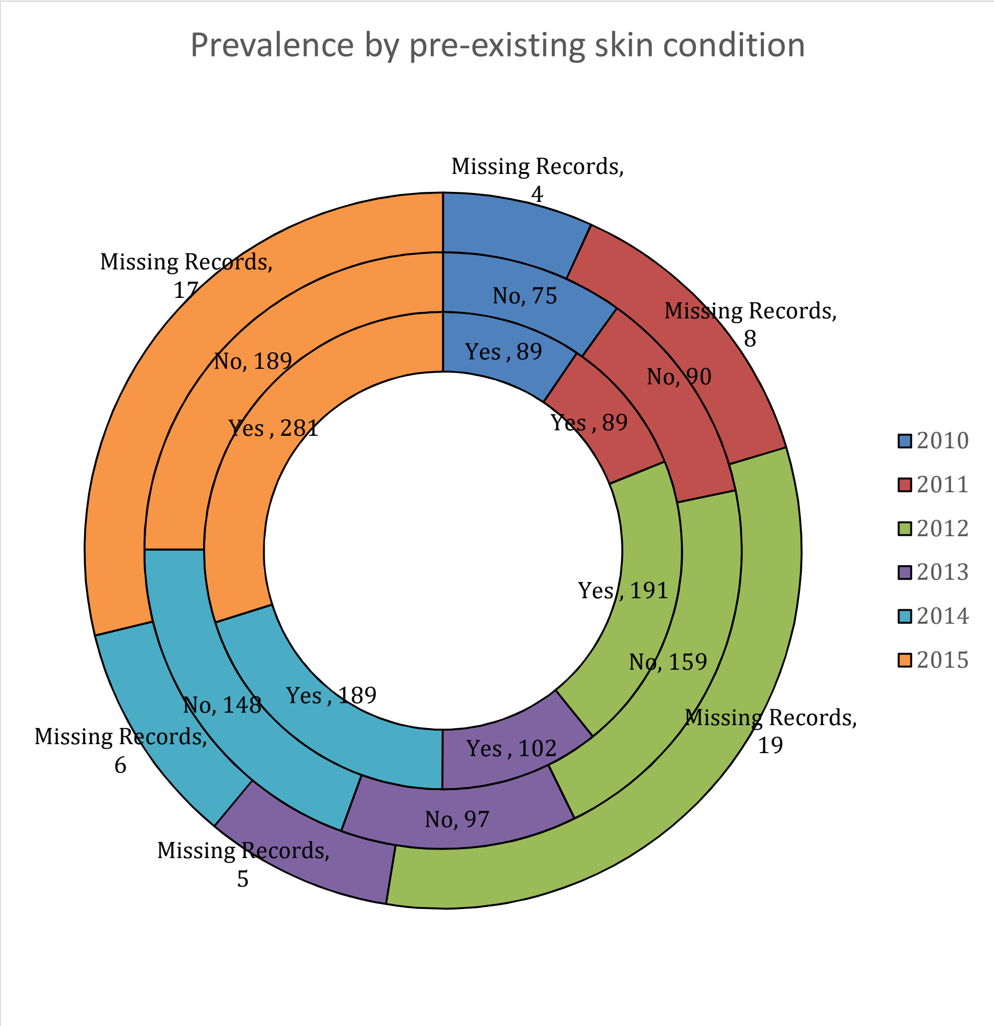
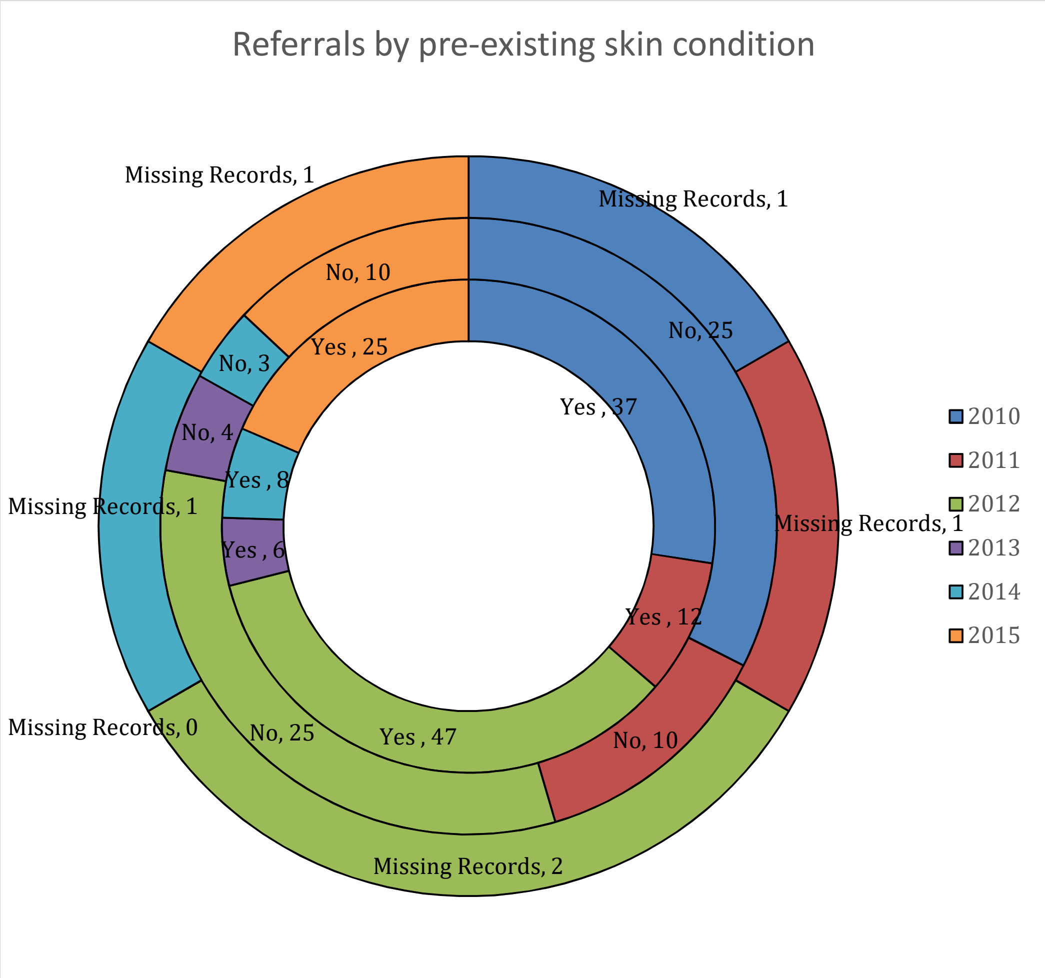


Figure 4.14 below, illustrates the referral cases by pre-existing skin condition. Although the numbers in this category are small compared to the incidence and prevalence groups, similar patterns occur concerning wet workers with pre-existing skin conditions. During the six year period 2010-2015 the most severe cases that required specialised OHS assessment were the cases of the wet

workers with pre-existing skin conditions. Fluctuations on the annual totals of wet workers with pre-existing skin conditions being observed: 2010 (37), 2011 (12), 2012 (47), 2013 (6), 2014 (8) and 2015 (25). The year 2012 appears to have the highest number of referral cases of wet workers.

Figure 4.14



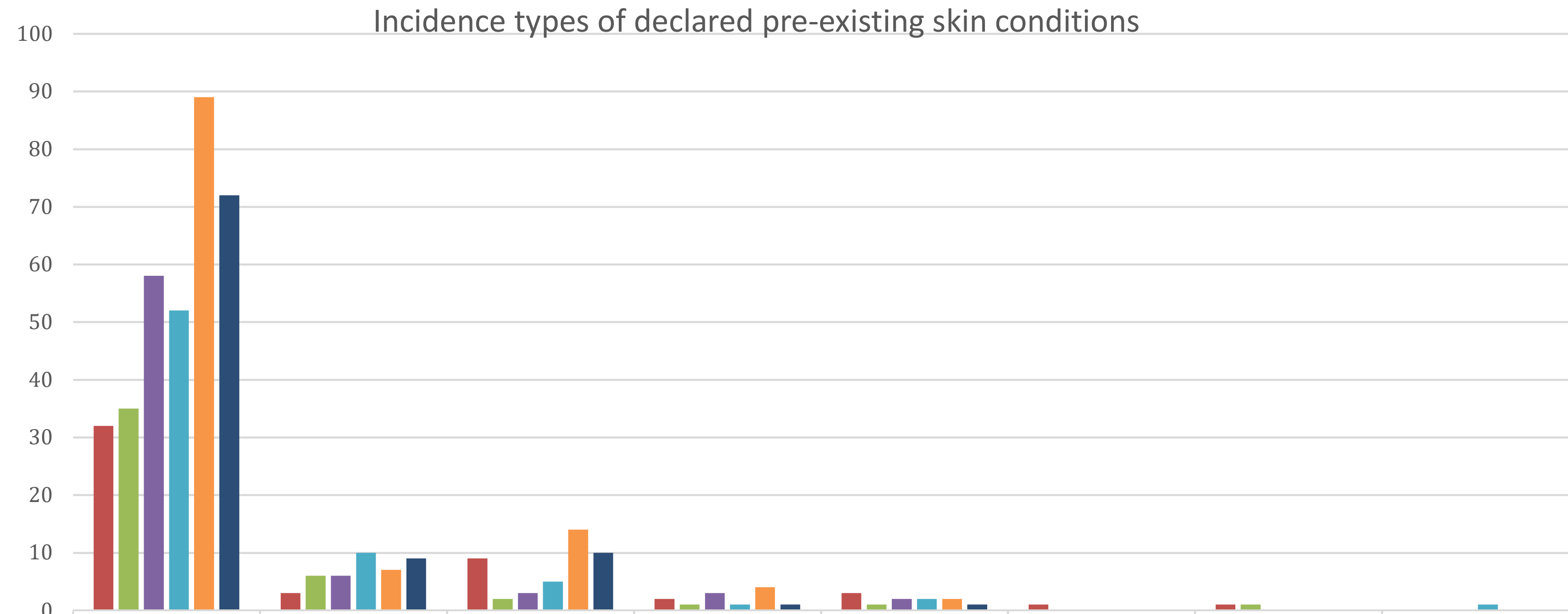
An influx of wet workers entering the annual skin surveillance scheme and consequently requiring further and more specialised assessment (referral cases) was noticed in 2012. Following the same year, a large drop in annual numbers for 2013 and 2014 is observed; however, in 2015 the total number of referral cases has increased again.

Types of declared pre-existing skin conditions

Figures 4.15, 4.16 and 4.17 illustrate the types of pre-existing skin conditions for each of the three groups (prevalence, incidence and referral cases) of wet workers. There were eight types of skin conditions according to the wet workers' declarations as shown in figure 4.15.

The most prevalent type of skin condition during 2010-2015 for the incidence category (figure 4.15) was dermatitis/eczema, with Psoriasis and Latex Allergy (reported by the wet workers) following. Combinations of Dermatitis/Eczema/Latex, Dermatitis/Eczema/Psoriasis/Latex, Psoriasis/Latex and Other Allergy had the lowest rates. With regard to prevalence category (figure 4.16), similar patterns occur; the highest rates of skin condition types were amongst Dermatitis/Eczema. Referral cases (figure 4.17) also have similar patterns; Dermatitis/Eczema have the highest rates during 2010-2015 with Dermatitis/Eczema/Latex allergy and Latex Allergy and Psoriasis to follow in succession.

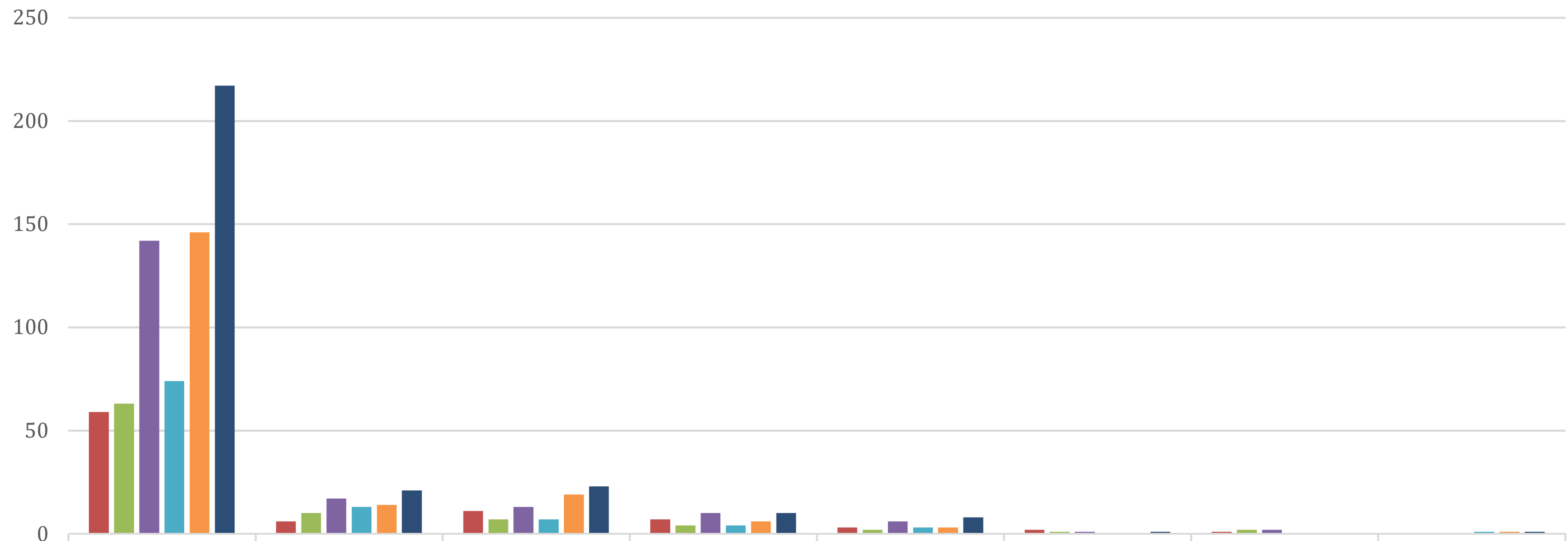
Figure 4.15



	DERMATITIS / ECZEMA	LATEX ALLERGY	PSORIASIS	DERMATITIS / ECZEMA / LATEX	DERMATITIS / ECZEMA / PSORIASIS	DERMATITIS / ECZEMA / PSORIASIS / LATEX	PSORIASIS / LATEX	OTHER ALLERGY
2010	32	3	9	2	3	1	1	0
2011	35	6	2	1	1	0	1	0
2012	58	6	3	3	2	0	0	0
2013	52	10	5	1	2	0	0	1
2014	89	7	14	4	2	0	0	0
2015	72	9	10	1	1	0	0	0

Figure 4.16

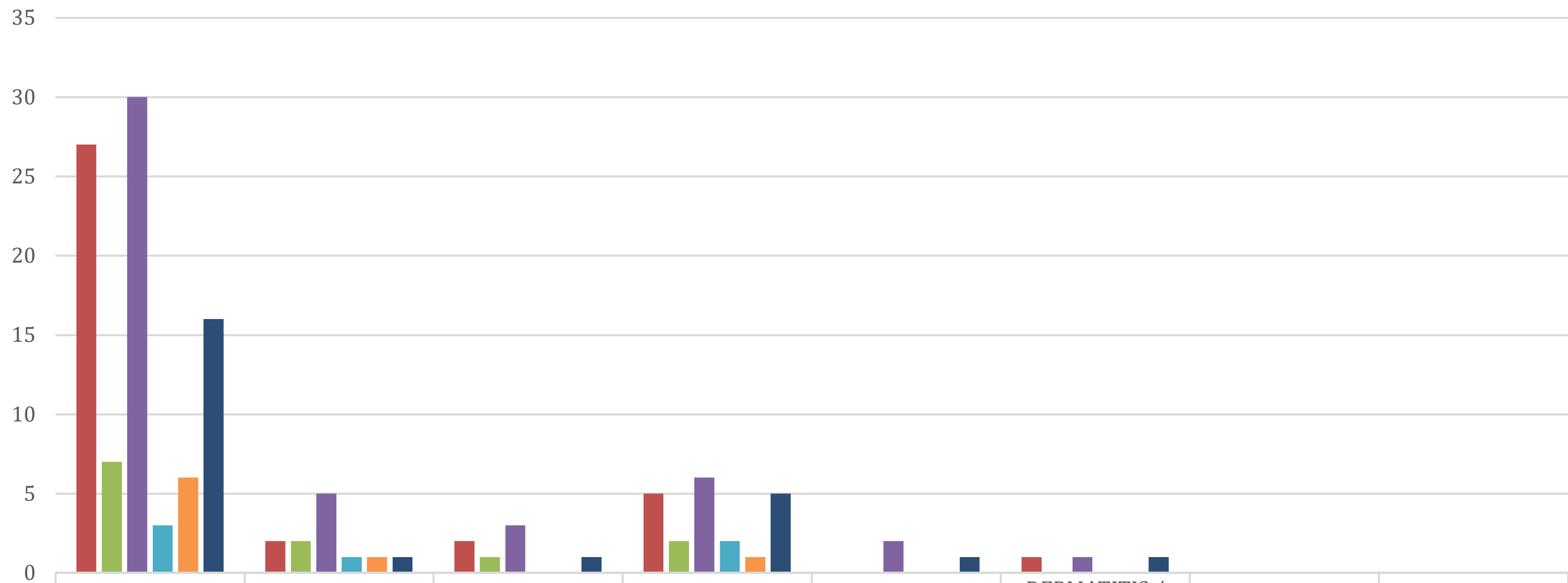
Prevalence types of declared pre-existing skin conditions



	DERMATITIS / ECZEMA	LATEX ALLERGY	PSORIASIS	DERMATITIS / ECZEMA / LATEX	DERMATITIS / ECZEMA / PSORIASIS	DERMATITIS / ECZEMA / PSORIASIS / LATEX	PSORIASIS / LATEX	OTHER ALLERGY
2010	59	6	11	7	3	2	1	0
2011	63	10	7	4	2	1	2	0
2012	142	17	13	10	6	1	2	0
2013	74	13	7	4	3	0	0	1
2014	146	14	19	6	3	0	0	1
2015	217	21	23	10	8	1	0	1

Figure 4.17

Referrals types of declared pre-existing skin conditions



	DERMATITIS / ECZEMA	LATEX ALLERGY	PSORIASIS	DERMATITIS / ECZEMA / LATEX	DERMATITIS / ECZEMA / PSORIASIS	DERMATITIS / ECZEMA / PSORIASIS / LATEX	PSORIASIS / LATEX	OTHER ALLERGY
2010	27	2	2	5	0	1	0	0
2011	7	2	1	2	0	0	0	0
2012	30	5	3	6	2	1	0	0
2013	3	1	0	2	0	0	0	0
2014	6	1	0	1	0	0	0	0
2015	16	1	1	5	1	1	0	0

The researcher also explored the frequencies of the aggregated categories for occupational groups and declarations of pre-existing skin conditions for the whole database (917). From the total of 917 cases, 27 (2.9%) were deemed as missing records as there were no records available to ascertain whether or not the wet workers had any pre-existing skin conditions prior to entering the OHS skin surveillance scheme. Hence, the valid total for the purpose of this analysis was 890 cases.

In appendix 4.6 it is illustrated how frequently each of the declarations of pre-existing skin conditions occurred in each of the aggregated occupational groups. It is evident that Dermatitis/Eczema has the highest rate of occurrence (39.1%) in all four occupational groups, followed by latex allergy (5.3%) and psoriasis (5.2%). Combined types of pre-existing skin diseases account for 7.1% of the sample and wet workers who have not self-declared any pre-existing skin conditions account for 43.4% of the sample. Another observation from appendix 4.6 was that during the six year period, the total number of wet workers (doctors/dentists, nurses/midwives, other clinical staff) who carried out clinical work (direct patient contact) as part of their day to day practice constituted the majority of the sample (847) compared to the administration and others group (43) who were still deemed wet workers but with no direct patient contact.

The occupational groups 'Doctors and Dentists' as well as the 'Administration and Others' of the wet workers' cases with no previous declarations (the cells which show significant deviation from the expected counts are the ones with the label 'Adjusted Residual' and are highlighted in appendix 4.6) appeared to be under represented. Such observation showed that wet workers with no pre-existing skin conditions from these groups are less likely to be under the OHS surveillance scheme. On the contrary, an over representation of cases with no pre-existing skin conditions is observed in the occupational group 'Nursing and Midwifery'. This observation shows that wet workers from this occupational group who have no pre-existing skin conditions are more likely to be in the OHS surveillance scheme.

A cross tabulation was performed in order to test a null hypothesis of no association between occupational group and declaration of pre-existing skin condition. A statistically significant association between the occupational groups under OHS surveillance and declarations of having pre-existing skin condition was identified (appendices 4.6 and 4.7 corresponding tables A1 and A2).

It is not possible to accurately determine how significantly over or under represented these occupational groups are when compared to the NHS Grampian population, since the OPAS sample of Study I, albeit representative is small. Moreover, as discussed previously, skin health surveillance at the time of Study I was not statutory for the whole population exposed to wet work; therefore, the findings are inconclusive.

Research Question (v)

Do the occupational groups under surveillance appear to represent commonly expected high-risk working areas for wet-work?

In order to be able to answer this research question it is essential to re-visit figures 4.9-4.11. These three charts illustrate the incidence, prevalence and referral cases by occupational group. Very similar observations occur in all three categories; the same six occupational groups occur for every category: 1. Nursing and Midwifery, 2. Medical Practitioners, 3. Allied health professionals, 4. Support services, 5. Pharmacists and 6. Administrative services. It is evident that these six groups consist of the highest numbers of wet workers in NHS Grampian OHS surveillance scheme. Table 4.9 below provides a summary of this observation. Moreover, Table 4.9 illustrates specifically which are the most frequently appearing areas of work that the affected occupational groups worked during the six year period. The occupational groups as well as the areas of work under OHS surveillance appear to represent commonly expected high-risk areas as well as professions for wet work (HSE 2018c and WHO 2009).

Table 4.9 Most Frequent Area of Work by Most Prevalent Occupational Groups

	Occupational Groups					
	Nursing and Midwifery	**Medical Practitioners**	**Allied Health Professionals**	**Support Services**	**Pharmacists**	**Administrative Services**
Incidence 2010-2015	520	89	54	73	21	29
Prevalence 2010-2015	1171	154	132	133	24	48
Referral Cases 2010-2015	153	11	24	11	6	2
Most Frequent Area of Work	-Acute Medicine (e.g. surgical, anaesthetic, Intensive Care Unit ITU, Hyperbaric) -Emergency Care Centre (e.g. emergency department, theatres, High Dependency Unit HDU) -Aberdeen Maternity Hospital (e.g. neonatal unit, labour ward) -Obstetrics and Gynaecology -Royal Aberdeen Children's Hospital (e.g. medical wards, emergency department, theatres) -Royal Cornhill Hospital (e.g. psychiatrics, forensic, substance misuse)	-Acute Medicine -Anaesthetics -Emergency Care Centre -Aberdeen Maternity Hospital -Obstetrics and Gynaecology -Royal Aberdeen Children's Hospital	-Acute Medicine -Aberdeenshire Community Hospitals (e.g. medical wards, minor Injuries) -Royal Aberdeen Children's Hospital -Royal Cornhill Hospital -Therapies (e.g. Aberdeen health village, Woodend Hydrotherapy)	-Acute Medicine -Operations/Support Services -Aberdeen Maternity Hospital -Laboratories (e.g. virology, microbiology, biochemistry)	-Acute Medicine -Pharmacy	-Acute Medicine -Corporate (e.g. Ashgrove House - Teaching and Development) -Royal Cornhill Hospital -Woodend Hospital

	-Woodend Hospital (e.g. medical wards, elective orthopaedic theatres) -Operations/Support Services (e.g. domestic services, porters) -Community Health					

4.5 Discussion

This section provides an overview of the main findings in relation to the aim and the research questions of Study I, the limitations, strengths and weaknesses of Study I, the interpretation of the findings in relation to published literature and how these findings informed Study II of this DPP project that follows in the next chapter.

4.5.1 National Databases

A number of data sources provide information regarding the incidence of work-related skin diseases in Great Britain. Statistics are also available about the prevalence of occupational skin disease in the Self-reported Work-related Illness survey which is carried out annually in the national Labour Force Survey. Table 4.10 below summarises these data sources. The overall estimation of work-related skin disease in Great Britain in regard to incidence and prevalence trends, identification of high-risk occupations as well as common agents consists of data collated by the above data sources. All schemes support different strengths and weaknesses. For instance, reporting to some schemes is voluntary (e.g. THOR-GP), other schemes' focus is on diagnosis or identification of causative agents (EPIDERM, OPRA), or the professionals who report to these schemes have different backgrounds (GPs, occupational health physicians and /or dermatologists). Overall, however, the official statistics reported and analysed by the HSE meet the highest standards of trustworthiness and are of high value (The University of Manchester 2019; HSE 2018a). The estimated prevalence numbers of self-reported skin disease as derived from the Labour Force Survey between 2007-2017 are small and present no major fluctuations when compared to the previous and following years. According to the 'Work-related skin disease in Great Britain, 2018' HSE report, the estimated annual new cases of self-reported work-related skin problems were 7,000. The estimated new cases of occupational contact dermatitis reported by dermatologists on EPIDERM in 2017 was 891, a number that continues to be small and it appears to be lower in the past five year period, when compared to the previous 10 years (HSE 2018a).

Table 4.10 Data sources in Great Britain

Data sources	Characteristics	Occupational Skin Disease in Great Britain	
THOR Schemes			
EPIDERM	-Scheme funded by the HSE -Consultant dermatologists report to EPIDERM	- Incidence	- Identify responsible agents -Determine the extent of occupational skin disease -Monitor changes
THOR-GP	Research network of General Practitioners with training in occupational medicine	- Incidence	-Work-related ill-health - Sickness absence
OPRA	Consultant occupational health physicians based in NHS hospitals in the UK	- Incidence	- Provides a broad picture of occupational disease and work related conditions in the UK - Data is collected on symptoms or diagnosis, occupation, industry and the likely causative agent
Labour Force Survey	Annual UK-wide study of the employment circumstances of the UK population. Conducted by the Office for National Statistics	- Prevalence	- Contains a Self-reported Work-related Illness survey

Nurses and dental practitioners remain amongst the occupations with high incidence rates as well as auxiliary nurses, nursery nurses, nursing assistants, medical practitioners and AHP. These high-risk occupations correspond to the high-risk occupations in the OPAS sample of Study I.

4.5.2 Local Database

Annual Incidence and Prevalence

The annual incidence and period prevalence of OIHD as reported in the OHS skin surveillance scheme during the period 2010-2015 was small (see table 4.7, page 98) when compared to the NHS Grampian population of wet workers. Despite the small numbers both incidence and period prevalence rates appear to increase annually which contradicts the reported flat prevalence numbers on the national databases.

In order to be able to calculate the period prevalence of the wet workers reported on the OHS surveillance scheme, the total headcount number of NHS Grampian employees at risk of developing OIHD was used as a denominator. That information (total headcount number) was obtained from the ISD website. It is noticed that the period prevalence percentages are very small. At this point it is crucial to mention that both the surveillance and referral cases annually reported to OHS represent wet workers who might have either developed skin issues during their employment or have been experiencing a deterioration of symptoms attributed to a pre-existing skin condition whilst at work. The numbers are small as a percentage of the whole population at risk of developing OIHD and it should be looked at within the context of the local database (OPAS) when drawing any conclusions.

It is also important to be mindful of the fact that the NHS Grampian population of wet workers became part of an NHS Grampian-wide statutory skin surveillance from 2016 onwards, after, that is, the period during which Study I took place (2010-2015). Therefore, the period prevalence percentages could be different and maybe larger than what was being observed during this study. It remains very important and relevant to acknowledge the increase of the period prevalence percentages towards the end of the six year period. This increase could be due to an increase in the numerator (i.e. increase in number of wet workers entering the OHS surveillance scheme), or a decrease in the denominator (i.e. the referent population). On review of the NHS Grampian employee grand totals (i.e. referent population) during the six year period, an annual increase was also found.

Despite the fact that it was not possible to ascertain the reason the observed increase occurred, work-related skin disease reporting amongst wet workers in healthcare industry remains of high importance, for it may not be recognised as an adverse health outcome by the individual, thus possibly impacting both the wet worker and the industry as a whole.

Wet workers' profile

Age-Gender

OIHD occurs at younger ages (less than 35 with most prevalent age groups 21-25, 26-30 and 31-35) and particularly amongst female wet workers. Lind et al. (2007) investigated the incidence of hand eczema in female Swedish hairdressers (a high risk wet work occupation) by carrying out a longitudinal retrospective cohort study from 1970 to 1995. One of the findings was that the age of onset eczema was at the age of 20 years or less for about half of the hairdressers (3665) and also the control group (5034). Moreover, for 40% of the hairdressers, hand eczema occurred during their vocational training (age of hairdressers at the time of study was <25 years) (Lind et al. 2007). Other studies that took place in Germany also found that prevalence and incidence rates of hand eczema were highest in younger age groups (Uter et al. 1999a and Uter et al. 1999b). The results from OPAS database also confirm that the highest prevalence and incidence in OIHD occurs in younger ages, while the average age of the workforce has been consistently reported to be within the age range of 40s.

Types of pre-existing skin conditions

Over half of the wet workers in the sample (56.7% of 504) of the OHS skin surveillance scheme during 2010-2015 had declared having pre-existing skin conditions prior to entering the surveillance scheme. The remaining 43.4% (386) had declared no history of pre-existing skin conditions. The evidence is compliant with the current literature and findings of other studies which have found that individuals with pre-existing skin conditions are more likely to experience symptoms of deterioration when carrying out wet work (Bauer et al. 2018). From the wet workers who had declared pre-existing skin conditions prior to entering the OHS skin surveillance scheme it was observed that dermatitis/eczema had the highest rate of incidence 39.1% (348), latex allergy came second with 5.3% (47) and psoriasis third with 5.2% (46). Combinations of these three main types

of pre-existing skin conditions previously declared by the wet workers consisted of 7.1% (63) of the sample.
For substances that act as sensitisers (substances capable of causing allergy) as for irritants (substances capable of causing cell damage), the duration and frequency of skin contact as well as the concentration are important factors that determine the risk of inducing sensitisation (HSE 1988). Although sensitisation may occur after the first contact or after many contacts or even never, in industries such as healthcare it is usually induced after a few months of repeated contact (HSE 1988). The findings of Study I regarding either 'latex allergy' or 'other allergy' declarations, were self-reported by the participants. Due to the lack of medical assessments or diagnostic tests (e.g. blood screening for latex allergy), it is not possible to ascertain whether the allergies were related in any way to wet work, the workplace, or any of the products used as PPE. The NHS Grampian health board has been deemed a latex-free organisation regarding the use of examination and sterile gloves between 2010 and 2015; therefore, exposure to latex via the use of gloves should be minimal. Latex maybe contained in other personal protective equipment materials such as surgical gowns, elasticated sleeves, masks, or the elasticated parts of surgical head caps, or medical equipment. In either case the percentage of the 'latex' or 'other' allergy declaration as type of pre-existing skin condition should be considered and interpreted with caution and by taking into consideration the aspects discussed above.

Occupational Groups

The types of occupational groups in the OHS skin surveillance scheme during 2010-2015 (for all three categories: prevalence, incidence and referral cases) with the highest rates were the nursing/midwifery (this includes registered and unregistered staff), medical practitioners, allied health professionals, support services and administrative services. The occupational groups under the NHS Grampian skin surveillance appear to represent commonly expected high-risk working areas for wet work. Nursing and midwifery, AHP and medical practitioners are three of the occupational groups with the highest rates of occurrence. Evidence from the EPIDERM database confirms that the reported occupational groups from GPs and dermatologists for the healthcare industry, are very similar (THORS04 2018). Should skin surveillance have been statutory in the organisation during the time Study I took place, the incidence rates by occupational group may have been different especially amongst these groups that have had lower incidence rates (such as general practitioners, medical support pharmacists and dentists/dental support). It is, therefore, possible these occupational groups are under-represented in Study I. As a result, OIHD may be prevalent amongst other occupational groups of wet workers impacting their health, wellbeing and work while not being recognised and addressed. Evidence from Study I regarding high-risk occupational groups is inconclusive as to whether 'Nursing/Midwifery' and 'Medical Practitioner' are the only two groups of wet workers with the highest rates of OIHD.

The benefit of undertaking this initial repeated cross-sectional study is that there was an apparent increase in the numbers of wet workers in NHS Grampian with skin problems within the OHS skin surveillance scheme in the six year period. In comparison to the national databases, these increased numbers did not appear to reflect the national reporting system and thus, this is an area of discrepancy. Recognition of occupational skin disease differs in each of the databases as discussed above and reporting is subject to diverse practices and schemes throughout the country. Another element to take into consideration when reflecting on the different numbers between local and national databases is that effective management of OIHD at an organisation level may have been a contributory factor of not escalating or further reporting cases.

4.5.3 Limitations

Data sources

The overall scale of reporting work-related skin disease in the UK is subject to a number of different data sources which provide information on incidence trends, prevalence estimations and identification of high-risk occupations, activities and causative agents. THOR which includes EPIDERM, THOR-GP and OPRA schemes for reporting occupational skin disease, captures cases reported by dermatologists, GPs and occupational physicians. The actual reported cases are restricted to severe cases; therefore, there is a possible degree of underreporting cases which should be taken into consideration when reviewing the annual rates of incidence and prevalence of occupational skin diseases in the UK. Data from THOR schemes remain the best sources of reported cases with the largest numbers and the best basis for more detailed (e.g. causal agents, occupational groups, identification of disease/diagnosis) statistical analysis to-date. Statistics that concern prevalence of skin disease are available annually based on the national Labour Force Survey (Self-Reported Work-related Illness survey, a module of questions included annually in the national Labour Force Survey) (HSE 2018a). Due to the wide variation of skin disease severity (from severe cases to minor irritations), data available from this source may not have captured the actual numbers of workers who have OSD, as the severity of a skin condition maybe be misjudged by the individual (HSE 2018a).

The OPAS software was a non-live database. This meant that the information regarding the NHS Grampian workforce (exact number of NHS Grampian staff in post, specifically the head-count for each year during the time of the research study) was not possible to be obtained from OPAS causing the researcher to obtain this information from ISD to be able to calculate the prevalence of OIHD. NHS Grampian produces a workforce report annually which provides information on the size and shape of the workforce. The annual workforce reports do not provide exact headcount numbers; therefore, it was not possible to calculate accurately the number of wet workers in the organisation based on NHS Grampian's workforce reports. Another peril of a non-live database was that some of the data concerning the details of the employees (e.g. area of work) may have not been up-to-date at the time the data was extracted for the purposes of Study I. Changes on OPAS records were carried out manually and therefore, prone to error.

System Error

An OPAS system error in 2012 (witnessed by the researcher whilst working in OHS) resulted in affecting the skin surveillance recall (annual follow-up of cases within the OHS skin surveillance scheme) of wet workers. A large number of wet workers were missed from the 2013 recall and as a result a drop in prevalence numbers appeared that year.

Product change

In 2012, the organisation introduced a new brand of the examination rubber gloves throughout the NHS Grampian hospitals and clinical areas. During the same period, an influx of the number of wet workers entering the OHS surveillance scheme has been observed. Association or causation between the new brand of examination gloves and the influx of the annual number of wet workers entering the surveillance scheme should not be assumed - a possible reason being that the new brand of examination gloves contained similar chemicals as the examination gloves used previously. Bhopal (2004) argued that the use of a set of criteria such as the Bradford Hill criteria for reaching causal judgements in epidemiology is controversial, however, such criteria provide a robust framework for reaching judgements and for ascertaining whether associations are causal. Temporality (for the exposure-disease relationship to be causal the exposure must precede the onset of disease) is one of the Bradford Hill criteria that applies in this case. Time and level of exposure to the new brand of glove in relation to developing OIHD could not have been determined between the time the gloves were introduced across the whole organisation and the time skin surveillance took place (Fedak et al. 2015).

Methods

Study I of this thesis consisted of a repeated cross-sectional study of the national and local databases respectively. As mentioned earlier in the chapter, one of the reasons for selecting this method was the available data type (national and local surveillance data records) which made this method the most appropriate to determine the period prevalence and incidence of OIHD.

Although cross-sectional studies are commonly used in social sciences as well as nursing, they mainly investigate prevalence (and not incidence) of a disease (Bowling, 2014). In Study I, characteristics such as age, gender, occupation and type of work of those who declared OIHD were not compared to those who declared not having OIHD. Statistical association was explored, as discussed earlier in the results section; however, no causality (e.g. it is shown that nurses are more likely to have pre-existing skin declarations, although it is not possible to ascertain why) could be identified. Bhopal (2004) uses the ‶snapshot″ analogy to argue that cross-sectional surveys capture a snapshot of health or disease as the sample is being surveyed in one point in time, which is somehow relevant to this study where the time period of data collection in both national and local databases was annual. While the incidence of OIHD for wet workers in the OHS skin surveillance scheme was reported, the very small numbers meant that the rate of OIHD could not be estimated (disease hazard rate, density and intensity over a period of time) (Bhopal 2004).

The OHS skin surveillance captured the wet workers who developed skin issues were caused by or made worse by work. Despite the fact that this was a representative sample of the NHS Grampian wet workers population (between the period 2010-2015), it was not possible to investigate high-risk factors or identify any possible associations these factors may have had in relation to the development or exacerbation of OIHD. That was due to limited time/resources available as well as due to the main focus of Study I which was to review the national and local databases in order to determine the probable prevalence and incidence of OIHD.

4.6 Conclusion & Implications for practice & research

Study I was set out to determine the reported scale of OIHD amongst HCWs locally and nationally by reviewing the relevant databases. The period prevalence of OIHD was calculated based on the available figures from the databases. The findings outlined that the numbers of wet workers in healthcare locally affected by OIHD have been increasing annually (OHS skin surveillance scheme between 2010 and 2015). Conversely, the estimated numbers of new cases as reported in HSE's 2018 annual report, were lower in the past five years when compared to ten years ago (HSE 2018). Contributory factors to the observed discrepancy between the reported cases locally and nationally may have been the following: i) adhering to different reporting routes of work-related skin disease to the THOR network at a local level, ii) using different criteria of escalating/reporting new cases to the THOR network at a local level iii) effective management/interventions of skin disease on a local level may have prevented escalation/reporting to THOR.

Communication between OHS and the specialists (e.g. dermatologists, GPs) locally who report work-related skin disease to THOR is essential. Such an approach may allow optimisation of reporting work-related skin disease from local to national level.

Recommendations for research:

- determine the scale of work-related skin disease amongst all HCWs at risk of developing OIHD locally. This will allow better understanding of the disease's extent in the whole wet workers population
- investigate high-risk factors and/or identify any possible associations of these factors in relation to the development or exacerbation of OIHD amongst wet workers in healthcare industries. This can contribute to the evidence-base for developing and testing interventions for the prevention of OIHD

Recommendations for practice:

- investigate the escalation/reporting approaches of work-related skin disease from the local to the national databases as this may provide a better insight with regards to the discrepancy observed between local and national databases
- investigate the effectiveness of interventions in preventing the development of OIHD in wet workers and in particular HCWs. This will promote the health and wellbeing of the individuals, prevent ill-health which can have long term health and career implications, promote patient care and finally reduce cost to the NHS.

The next chapter provides the aim, methods, results and discussion of a systematic review of the world-wide literature on the effectiveness of interventions for the prevention of OIHD.

Chapter 5

Study II

Title: Effectiveness of interventions for the prevention of OIHD: A quantitative systematic review.

5.1 Introduction to the chapter

Chapter 5 presents the second study in this thesis, which consisted of a systematic review of the international literature on the effectiveness of interventions for the prevention of OIHD.

There were several reasons for conducting a systematic review of the international literature as part of this DPP project, which will be discussed extensively later in this chapter. Identifying the best evidence for preventing OIHD outside the healthcare industries was the most significant reason among them, as the review findings could be used, together with the findings of Studies I and II comprising this thesis, to inform the development of an evidence-based complex intervention, in keeping with the MRC guidance (Craig et al. 2008).

Occupational-related skin issues, including OIHD, are significant problems amongst the wet work populations can cause long-term ill-health, and have adverse career implications for wet workers across various industries (HSE 2014; Palmer, Brown and Hobson 2013; De Craecker, Roskams and Op De Beeck 2008). Recognition and reporting of OSD within the population of wet workers differs between the UK, Europe and U.S.; however, despite the differences it appears that underreporting of OSD is a recognised common theme (HSE 2014; WHO 2009; De Craecker, Roskams and Op De Beeck 2008). Skin diseases were listed as the second most common occupational health problem in Europe in 2008, as published in the European Risk Observatory report by the European Agency for Safety and Health at Work (De Craecker, Roskams and Op De Beeck 2008). Occupational skin diseases particularly for wet workers within healthcare industries, pose a significant problem that can impact upon the health of the individual, patient care delivery and also add cost to health services (Brown 2004). Early intervention and assessment are crucial to achieving successful long-term outcomes for HCWs with or without pre-existing skin conditions.

A systematic review on the effectiveness of interventions to prevent OIHD was required in order to efficiently integrate existing evidence to this DPP project and provide data for informing the need of the development of an evidence-based intervention. Moreover, this review was developed due to lack of studies focusing on primary prevention of OIHD identified in the scoping search. Existing reviews concluded that mixed populations (wet workers with and without-pre-existing skin conditions), heterogeneity of interventions and methodological weaknesses (e.g. lack of standardised assessments for OIHD identification, evaluating skin severity and time periods the studies were carried out) although positive, are insufficient to evaluate the effectiveness of interventions. These gaps created the need for the development of a focused review to assess the effectiveness of interventions used in primary prevention of OIHD.

Previous Systematic Reviews

Following a search of COCHRANE CENTRAL database of reviews, EMBASE, MEDLINE, a significant body of literature as well as three published systematic reviews were identified between 2005 and 2015. Saary et al. (2005) conducted a systematic review of international studies published between 1960 and 2003 to provide the Workplace Safety and Insurance Board (WSIB) of Ontario, Canada, with evidence-based recommendations regarding treatment decisions for OCD. Although 49 studies met the inclusion criteria, only a limited number of interventions effectively treated Occupational Irritant Contact Dermatitis (OICD) and OACD. Smedley et al. (2011) carried out a systematic review of 11 international RCTs on the management of occupational dermatitis focusing specifically on HCWs between 1950 and 2008. The two major limitations of the literature were that firstly there was no statistical significance (large studies failed to determine whether primary prevention is helpful), which indicated the need to include evidence from other comprehensive reviews with quantitative study designs. The second major limitation was the lack of intervention uniformity. Bauer et al. (2010) conducted a Cochrane review of RCTs published between 2003 and 2011. The findings of this review focused around the emergence of the change of worker's behaviour towards prevention of OIHD by using creams, reducing hand washing as well as refraining from wet work. Bauer et al. updated their review in 2018 after this review was registered and published. It was, therefore, not included in this systematic review, their results, however, will be discussed later in this chapter. The new Cochrane review aimed to assess the effects of primary prevention of OIHD in healthy wet workers.

Despite the lack of robust evidence regarding the prevention of OIHD provided by previous systematic reviews, the author decided to conduct a further systematic review because the initial literature review searching identified studies conducted since the publication date of the previous reviews that may have been suitable for inclusion in a new synthesis (e.g. Skudlik et al. 2012 and Bauer et al. 2010). The emergence of recent literature as well as the specific nature of the previous systematic reviews conducted on this topic, provided the direction for a further review in an attempt to fill this knowledge gap by: i) identifying and appraising a broader range of literature, including recent intervention studies, focused on the prevention of OIHD amongst wet workers; and ii) focusing on the strategy and effectiveness of measures to prevent OIHD amongst HCWs. The review was conducted in accordance with the JBI systematic review methodology and guided by an a-priori published protocol (Page, Shamseer and Tricco 2018; Papadatou et al. 2016). The systematic review protocol was developed based on the JBI Evidence Based Healthcare model as developed by Pearson et al. in 2005 and revised in 2019 by Jordan, Lockwood and Aromataris.

5.1.1 Aim

The aim of the review was to identify, appraise and synthesize the best available evidence on the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions (a combination of two or more of the interventions listed here) in preventing OIHD in wet workers, comparing each intervention to an alternative intervention or to usual care (workers' regular skin care regimen).

5.1.2 Systematic Review Question

The specific review question was: what is the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions in preventing OIHD in wet workers?

5.2 Methodology

Systematic reviews consist of structured approaches with the aim to synthesise, summarise and discuss existing knowledge (Aromataris and Munn 2017). Systematically appraising evidence underpins the traditional approaches to evidence-based healthcare (Moola et al. 2015). The use of specific standards and the quality of methods followed contribute to the extent to which bias and risk of error are minimised during a review (Aromataris and Munn 2017). Systematic reviews can be conducted using various approaches, based on the factors/phenomena of interest and objective(s) of the review. There are several different review types (see table 5.1 for some examples), the approach being dependent on the review question.

Table 5.1 JBI Systematic Review Approaches

Systematic Review Approach	Brief description
Systematic Reviews of experiences or meaningfulness	Synthesis of qualitative evidence by using meta aggregation
Systematic reviews of effectiveness	Identification, appraisal and synthesis of quantitative evidence (using RCTs, experimental, quasi-experimental and observational studies) to examine the effectiveness of an intervention
Systematic reviews of text and opinion/policy	Use of text and opinion-based evidence to inform clinical decision-making processes
Systematic reviews of prevalence and incidence	Synthesis of evidence of prevalence and incidence data
Systematic reviews of costs of a certain intervention, process or procedure	Measurement of a resource's use, costs and benefit/effect consequences of two or more interventions
Systematic reviews of aetiology and risk	Assessments of association between factors and the development of a disease, health condition or other health outcome
Systematic reviews of mixed methods	Systematic reviews that synthesize two or more types of data (e.g. qualitative and quantitative)
Systematic reviews of diagnostic test accuracy	Measures of diagnostic tests' accuracy by using several pairs of measures
Umbrella reviews	Systematically reviewing existing systematic reviews
Scoping reviews	Mapping of evidence/clarification of key concepts and definitions that underpin a specific research field

Adapted from Aromataris and Munn 2017

Following the initial scoping review of the literature, a plethora of quantitative studies (e.g. RCTs and observational studies) assessing the prevention of OIHD through a variety of interventions emerged. This informed both the need to synthesize and discuss the existing knowledge and to develop the aim and research question of Study II. Conducting a systematic review of effectiveness was deemed the most appropriate approach in fulfilment of Study's II objective.

The systematic review of Study II examined quantitative evidence that considered any experimental study design including RCTs, non-randomized controlled trials, quasi-experimental and before and after studies in order to establish the effectiveness of interventions in the primary prevention of OIHD in wet workers at work and at home (before and after work).

5.3 Methods

Narrative versus Systematic Reviews of the literature

A narrative literature review typically appraises and summarises the literature of a specific topic in a written report. Such reviews provide a broad overview of a topic rather than addressing a specific research question, without conducting any integration of the findings (Onwuegbuzie and Frels 2016). Conversely, systematic reviews are fundamental in generating research knowledge and have an integral role in finding, describing, synthesising and appraising evidence utilising systematic approaches (Gough, Oliver and Thomas 2017). Systematic reviews are considered to be a major methodological development of the past decades despite the strong practical, political and methodological criticisms (Gough, Oliver and Thomas 2017). Although systematic review techniques are developing rapidly, many reviews are still focusing on clinical effectiveness and may omit to explain issues of appropriateness, feasibility and meaningfulness (Gough, Oliver and Thomas 2017). Narrative reviews differ from systematic reviews in various areas as outlined in table 5.2 below. It can be seen (Table 5.2) that the key differences concern: (i) the scope of questions asked (in narrative reviews the questions are broad whereas in systematic the questions are focussed), (ii) how rigorous the appraisal is, (iii) the nature of evidence synthesis (qualitative versus quantitative) and (iv) the validity of evidence analysis.

Table 5.2 Comparing narrative and systematic reviews

	Narrative Review	**Systematic Review**
Search	Seeks to identify significant items in the field	Seeks to systematically search for, appraise and synthesise research evidence in an unbiased way
Appraisal	May or may not include quality assessment	Quality assessment may determine inclusion/exclusion and the assessment should ideally be conducted by two independent reviewers
Synthesis	Typically narrative, perhaps conceptual or chronological	Typically narrative with tabular accompaniment. Type of evidence synthesis is usually chosen to fit the type(s) of data within the review
Analysis	Analysis may be chronological, conceptual, thematic, etc. Typically does not report on the validity of the studies included	Interprets the finding and presents a balanced and impartial summary. Offers recommendations for practice and for future research

Adapted from Grant and Booth 2009; Hemingway and Brereton 2009

Systematic Review Bodies

There are several established organisations and bodies globally with the specific aim of supporting systematic reviews. The Cochrane Systematic Review is a type of systematic review that covers topics relevant to healthcare, health services and fields of medicine (Cochrane Library 2019). Cochrane reviews and protocols appraise studies from a variety of databases using explicit systematic methods to meet pre-specified criteria. The reviews are published in the Cochrane Database of Systematic Reviews and they are categorised as interventions, diagnostic, overview, qualitative and prognosis (Cochrane Library 2019). The Centre for Reviews and Dissemination (CRD) is a world-renowned research institute based in York University that specialises in evidence synthesis using evidence with specific focus on healthcare topics (Centre for Reviews and Dissemination 2019). The CRD undertakes high quality systematic reviews using evidence from a wide range of research resources to inform national policy development and decision-making relating to health and wellbeing (Centre for Reviews and Dissemination 2019). The Joanna Briggs Institute (JBI) is an international research and development centre based at the University of Adelaide in South Australia that specialises in evidence-based healthcare. The JBI collaborates with 70 entities around the world and produces systematic reviews of healthcare practices with the aim of improving healthcare and inform decision-making internationally (JBI 2019). As an extension of its global collaborations the JBI collaborates with the Scottish Centre for Evidence-Based Multi-professional Practice based at the Robert Gordon University (The Scottish Centre for Evidence-Based Multiprofessional Practice 2019). The Scottish Centre's activities include training in conducting JBI systematic reviews, conducting systematic reviews with the aim to inform evidence-based healthcare and working with clinical personnel and service users in order to identify relevant topics as well as to apply the findings into practice (Joanna Briggs Institute Centre of Excellence 2019). Given the affiliation between the JBI and Robert Gordon University as well as the extended global focus in promoting evidence-based resources for healthcare professionals, service providers and users, the researcher undertook training with the JBI. The principal supervisor is the director of the Scottish Centre for Evidence-based Multi-professional Practice as well as an accredited trainer with the JBI. A quantitative systematic review of effectiveness of the world-wide literature was conducted in Study II of this DPP research project and was registered with the JBI. A criticism relevant to Study II is that systematic reviews of effectiveness are only concerned with questions regarding the effectiveness of studies. The use of only postpositivist paradigms captures fewer studies, excluding in this way other studies of relevance (Oakley et al. 2005). Despite the criticism scholars argue that these types of systematic reviews can apply a variety of questions and methods and contribute to developing multidimensional ways of understanding a specific topic (Gough, Oliver and Thomas 2017). Moreover, narrow review questions, inclusion and/or exclusion criteria, have been criticised of limiting the boundaries of studies to be considered and therefore, narrowing the conclusions. These limitations can be harnessed by having explicit titles, introduction and review summaries to avoid both bias and misinterpretations (Gough, Oliver and Thomas 2017). Systematic review findings typically are aggregated in order to produce evidence synthesis; Meta-analysis is a statistical approach for synthesising quantitative data as part of a quantitative review, whereas, meta-synthesis is an approach for synthesising qualitative data (JBI 2013). Narrative synthesis is used to report findings when it is not possible to conduct meta-analysis (JBI 2013).

Study II of this thesis consisted of an effectiveness review of qualitative studies of the world-wide literature via the JBI which specialises in evidence-based healthcare research. The aim of the review was to identify, appraise and synthesise the best available evidence of the effectiveness of interventions in preventing OIHD in wet workers in order to understand how and in which context (occupation and/or industry) preventative mechanisms of OIHD are effective. The outcomes of the systematic review would guide and provide the rationale for Study III.

5.3.1 Inclusion Criteria

The PICO process is a method of compiling a search strategy that enables a more evidence-based approach to literature searching (O'Connor, Green and Higgins 2011). The core elements of PICO were employed for Study II as follows:

Population or **P**articipants

Intervention, interest of exposure

Control or **C**omparator

Outcomes to be measured (JBI 2013).

5.3.1.2 Types of Participants

The review focused specifically on wet workers from healthcare, (i.e. nurses, doctors and AHPs) and also those from different wet work occupations such as hairdressers, florists, catering workers, metal workers at similar risk of developing OIHD due to frequent hand washing, skin contact with substances contained in soaps and/or hand gels and/or prolonged use of gloves. The review intended to include primary prevention studies where participants had no pre-existing skin conditions. Moreover, it was intended to include mixed population (pre-existing and no pre-existing skin conditions) studies where the data for participants without pre-existing skin conditions could be extracted separately.

5.3.1.3 Types of Interventions

Studies that measured the effectiveness of the following interventions in the primary prevention of OIHD in wet workers at the workplace and at home (before and after work) were considered:

- Use of moisturizers, for example, high and low lipid content moisturizers.
- Use of barrier creams, for example, barrier creams which may contain substances such as liquid paraffin lotion, lanolin oil, silicone or hydrocarbon.
- Wearing gloves (rubber and/or cotton).
- Education (e.g. seminars and training courses; face-to-face or online delivery).

Due to the variability in regimens, any dosage/intensity of preventive intervention for any length of time, including complex interventions that combined more than one of the above interventions was considered for inclusion in the review.

5.3.1.4 Types of Comparisons

Studies that compared one type of intervention to another were considered for inclusion in this review. Studies that compared an intervention to a control group who did not receive any intervention were also considered.

5.3.1.5 Types of Outcomes

This review considered studies that included the following primary and secondary outcome measures as shown in table 5.3 below:

Table 5.3 Systematic Review Outcomes

Primary Outcomes	**Secondary Outcomes**
Clinical evaluation (severity/improvement) of the signs or symptoms either by the investigator or the participant. Clinical assessment or self-report measure was considered for inclusion, such as: i) questionnaires and clinical examinations of hands, ii) telephone interviews and questionnaires based on the Nordic Occupational Skin Questionnaire (NOSQ-2002) and iii) self-administered questionnaires.	Product evaluation (proportion of participants satisfied with the products given in the study including cosmetic, preventive and therapeutic properties of the products). Any information which was recorded in the studies that rated the quality of the products was considered as a means of measurement either from the side of the participants, or the clinicians or other outcome assessors.
Adverse outcomes, for example, infections, severe irritation or allergy to products applied in the studies assessed by the participants and/or clinicians and/or outcome assessors reported in the studies.	Change of occupation because of OIHD versus staying in the occupation that may have been recorded in the studies, where the reason for changing occupation has been clearly stated as OIHD.

5.3.1.6 Types of Studies

This review considered quantitative studies for inclusion hence these studies were of experimental design including randomized controlled trials, non-randomized controlled trials, quasi experimental, and before and after studies.

5.3.2 Search Strategy

The search strategy sought to identify published and unpublished literature in the English language between 2004 and 2017. The search range chosen covered the period from the most recently updated HSE guidance note on skin disease (2004) and Bauer et al. (2010) systematic review up to the date this review was conducted. An information scientist was consulted and assisted with developing the search strategy. A three-step search strategy was utilized across eight databases.

1. An initial limited search of MEDLINE and CINAHL databases was undertaken using the initial keywords: ‵‵dermatitis′′, ‵‵occupational health′′

and ''occupational skin disease''. This was followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the articles.

2. A second search using all identified keywords and index terms was then undertaken across all included databases: COCHRANE CENTRAL, MEDLINE, CINAHL, AMED, Embase. The search for unpublished studies included:

3. Google Scholar, Open DOAR, and Robert Gordon University's digital repository of research publication, ''OPEN AIR''.

4. Thirdly, the reference list of all identified reports and articles considered for inclusion for identification of additional studies. The search resulted in literature on occupations not relevant to this review. Initial screening identified which occupations were included in these studies and only included for further screening those who were considered wet workers.

More analytically, the databases that were searched were:

1. Medical Literature Analysis and Retrieval System Online (MEDLINE)

Medline is the primary bibliographic database in the United States of America containing more than 25 million records in life sciences (U.S. National Library of Medicine 2019).

2. Cumulative Index of Nursing and Allied Health Literature (CINAHL)

CINAHL database contains over 6 million records from the UK, USA and other countries for nursing and allied health professionals (EBSCO Health 2019).

3. Cochrane Central Register of Controlled Trials (CENTRAL)

The Cochrane Central Register of Controlled Trials is a database of the Cochrane Library which contains different types of high quality, independent evidence regarding healthcare matters. It comprises of reports of randomized and quasi-randomized controlled trials (Cochrane Library 2019).

4. Allied and Complementary Medicine (AMED)

AMED is an alternative medicine database produced by the Health Care Information Service of the British Library and covers subjects such as alternative and complementary medicine, as well as palliative medicine, occupational therapy and physiotherapy. It covers references and articles in English mainly in Europe (OVID 2019).

5. Excerpta Medica database (Embase)

Embase is a biomedical research database that covers international biomedical literature with over 31 million records. It also contains high-quality systematic reviews, journal articles that are not included in MEDLINE as well as conference abstracts (Elsevier 2019).

6. Google Scholar

Following consultation from the Robert Gordon University's librarians, a Google Scholar search was conducted to look for unpublished/grey literature. Google scholar is an online search engine of broad scholarly literature. It was advised by the library experts to stop the search after no new studies appeared on the results. The searching for this review stopped after reviewing the first 14 pages (with 20 results per page).

7. OpenDOAR

OpenDOAR is a global database of academic open access repositories with full text resources which are of use to academic researchers (Sherpa 2019). This directory was searched for unpublished studies.

8. OPEN AIR Robert Gordon University's thesis database

Robert Gordon University's digital repository which contained research publications produced by staff and graduate students was also searched for unpublished studies (OpenAIR 2019).

Title and abstract screening of the papers returned by this search were independently screened by two reviewers in relation to the paper's title, aim, research question(s) and inclusion criteria which was then followed by full text screening. Independently screening reviewers can significantly reduce the risk of errors, especially when one of the two reviewers has limited experience (Moller and Myles 2016; Moher and Jadad 2003). There were only minor disagreements and uncertainties raised for some of the papers screened between the two reviewers, which were resolved through discussion.

5.3.3 Assessment of Methodological quality

As no studies were located that met the eligibility criteria of the systematic review, assessment of methodological quality, data extraction and synthesis were not performed.

5.4 Results

A total of 5418 titles were retrieved from the eight databases discussed above, of which 1854 were duplicates within the same databases and were, therefore, removed (Papadatou, Williams and Cooper 2018). Following deduplication, 3654 articles were left to be screened by two independent reviewers. Title and abstract screening excluded 3508 articles leaving 56 full-text papers for further review. These papers were identified across CINAHL, COCHRANE CENTRAL, MEDLINE and EMBASE and were also screened by two independent reviewers. Both the reviewers agreed to exclude all 56 articles as they did not meet the inclusion criteria of the review. Figure 5.1 illustrates this process.

The majority of the studies identified were excluded due to recruiting mixed populations of participants with and without pre-existing skin conditions. On close inspection, it was apparent that data from participants without pre-existing skin conditions could not be extracted separately.

Some studies were excluded due to the population not being wet workers (Turner et al. 2012; Williams et al. 2010; Funke 2007). In terms of study design, a common theme that was identified during the identification and retrieval of these studies was that a variety of methods was used for reporting and scoring the existence and severity of pre-existing skin conditions. A list of the excluded papers and the reason for exclusion are documented in appendix 5.1.

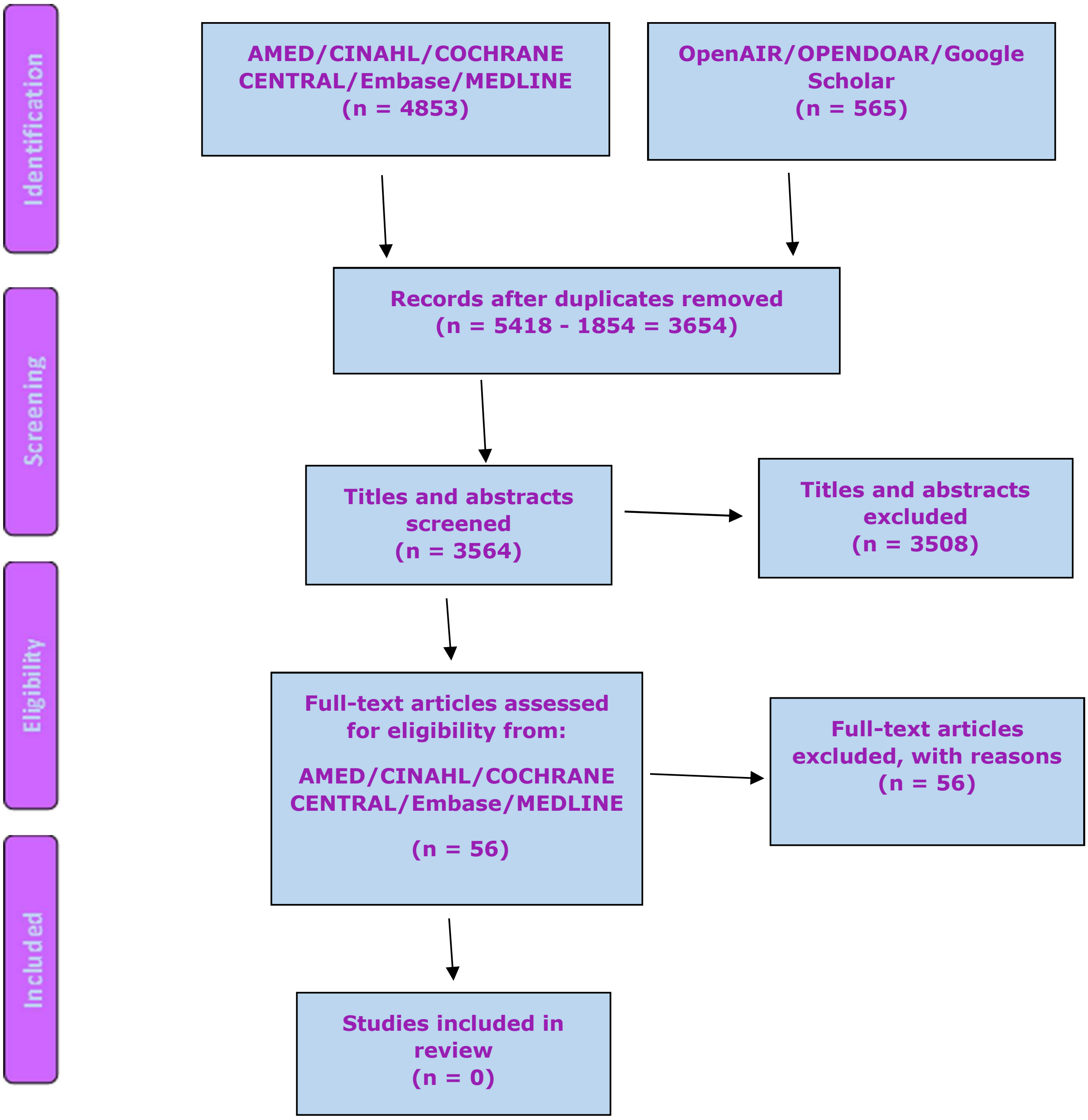


Figure 5.1 PRISMA flowchart for the systematic review selection and inclusion process

It was not possible to answer the review question, however, the following section provides an overview of the literature that might have been included (had it reported no pre-existing conditions separately) in order to inform outcome measures and promising results.

5.5 Discussion

The aim of this review was to identify, appraise and synthesize the best available evidence on the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions (a combination of two or more of the interventions listed here) in preventing OIHD in wet workers, comparing each intervention to an alternative intervention or to usual care (workers' regular skin care regimen).

5.5.1 Key Findings

A number of studies was identified with published evidence of interventions focused on the prevention of occupational skin disease. However, these studies included mixed populations of participants with and without pre-existing skin conditions and as a result data from participants without pre-existing skin conditions could not be extracted and analysed separately (van der Meer et al. 2015; Bregnhoj et al. 2012; Kutting et al. 2010; Visscher Davis and Wickett 2009; Winker et al. 2009; Flyvholm and Frydendall-Jepsen 2008; Mygind et al. 2006; Flyvholm et al. 2005; Sell et al. 2005; Jungbauer et al. 2004; Held et al. 2002). Although improvement of skin issues in the intervention groups was reported in the excluded studies, it was not possible to ascertain whether that was attributed to the effectiveness of the intervention as a primary prevention technique or due to the effectiveness of interventions in reducing symptoms of pre-existing skin disease. A key finding of this systematic review, therefore, was the lack of studies with mixed populations where data for participants without pre-existing skin conditions can be extracted separately. Moreover, there were variations of the evaluation of the severity of the skin disease at baseline in before and after studies. Tools such as questionnaires, measurement of transepidermal water loss (TEWL), clinical examination of hands and patch testing were used for evaluation. However, self-reported responses from participants was the most frequent evaluation which is considered a methodological limitation since it can lead to an underestimation of the disease severity (van der Meer et al. 2014). Bauer et al. (2018) concluded that there is a need of trials that apply standardised measures for the detection of OIHD in order to determine the effectiveness of the different preventative interventions. Having homogeneity in clinically assessing and evaluating skin disease is another key recommendation of this review as it may lead in improved outcomes and be transferred across wet work occupations.

5.5.2 Strengths and limitations

A key strength of this systematic review was that it was conducted using the JBI Model of Evidence-Based Healthcare approach, which is a robust and internationally used and acclaimed model (Jordan Lockwood and Aromataris 2019). Best practice was followed when the systematic review took place and two independent reviewers screened separately the identified literature and decided whether the studies should be included based on this review's inclusion/exclusion criteria.

Another strength of this review was the fact that it was a so-called 'empty review' (Slyer 2016). Although empty reviews may be subject to publication bias and to unpublished studies in scholarly journals, the JBI and other organisations such as the Cochrane Collaboration understand the importance of publishing empty reviews (Slyer 2016). This review highlighted the gaps in the literature and can guide with its recommendations the types of research designs required in order to identify the best way to prevent OIHD.

With regards to the limitations of this review, the lack of evidence may have been a result of the specific search itself. This review was deliberately narrow in focus (restricted inclusion criteria for primary prevention of OIHD) so as to contribute to the existing reviews and add new knowledge in the evidence-based practice. During the initial searches of the literature it became apparent to the authors that both the research question and inclusion criteria were highly specific and may produce no eligible studies for inclusion. While this issue was foreseen at the protocol development stage, the need for conducting the review was established by: i) the lack of up to date evidence on primary prevention of OIHD and ii) the need to identify and appraise a broader range of literature.

The review was restricted to papers in English language only. The researcher developed the search terms of the review in consultation with an information specialist from Robert Gordon University, as well as an occupational health physician with specialty in work-related skin diseases however, the literature in this area was not standardised and remained difficult to locate. The scoping search of this review identified three systematic reviews, however, one was published prior to the lower range date of this review, a second one focused on the management of OIHD, and a third study used mixed populations.

5.6 Conclusion & Implications for practice & research

This systematic review identified a plethora of evidence in relation to preventing OIHD. However, there is currently a lack of high quality evidence relating to the primary prevention of OIHD. This is not to imply that the current interventions are ineffective but that the available evidence are insufficient to ascertain the effectiveness of intervention in primary prevention of OIHD.

No primary prevention studies were found that fulfilled this review's inclusion criteria. In the identified studies where mixed populations were employed, data for participants without pre-existing skin conditions could not be separated. As a result, it was not possible to ascertain whether any skin changes were due to the effectiveness of the intervention(s) or due to symptom (related to pre-existing skin condition) improvement. It is well known that literature in this field can be difficult to locate due to the lack of standardised search terms. It is important to mention that during this review's scoping search, three systematic reviews were identified, suggesting that there is literature in this topic. However, the reviews were not included due to: i) being published out with the date range of this review's interest, ii) focused on management of OIHD rather than prevention and iii) included studies with mixed populations. Therefore, no conclusive recommendations can be made regarding the effectiveness of interventions in preventing OIHD.

In their most recent review Bauer et al. (2018) recommended that larger scale RCTs are required in order to be able to assess the effectiveness of interventions in primary OIHD. The review's inclusion criteria involved various types of RCTs (parallel, split-body and cross-over) aimed at assessing the effects of preventative interventions (moisturisers, barrier creams, protective gloves, combinations of interventions or skin protection education) on primary prevention of OIHD in healthy wet workers at baseline (Bauer et al. 2018). Controlled Clinical Trials (CCTs) were excluded from the review due to their low level of evidence. The eligible studies included were nine RCTs which were different from each other. Methodological and clinical diversity, including diagnostic criteria and severity scores of OIHD, did not allow meaningful combination of the results. Bauer et al. (2018) concluded that the evidence was of low quality, therefore, it was not possible to ascertain whether the different preventative strategies identified could effectively prevent OIHD. It is important to clarify that interventions such as the use of moisturisers alone or in combination with barrier creams had positive effects in short or long-term primary prevention of OIHD, however, the results of these comparisons were imprecise and of low quality therefore, their effect estimation was limited and inconclusive (Bauer et al. 2018). Moreover, they argued that there is a need of further trials to apply standardised measures of OIHD identification. Similarly in the 2010 review, Bauer et al. concluded that larger well designed RCTs were needed to establish effectiveness of OIHD preventative strategies.

There are undoubtedly many indications of the effectiveness on interventions aimed to prevent OIHD. However, the actual benefit of a single or combined intervention within the context of the workplace is yet unclear. It was therefore, of high importance to conduct another systematic review in order to: i) include more recent literature and ii) study designs other than RCTs. Following this review, it is recommended that future research considers the exploration of the possibility and feasibility of: i) accurate identification of wet workers without pre-existing skin conditions, ii) homogeneity of OIHD diagnosis and severity scoring and iii) when large RTCs take place to consider separate data analysis of wet workers with and without pre-existing skin conditions. Quantitative research studies are also required in order to bridge the identified evidence gap and hopefully reach a consensus on methods of assessing severity of skin conditions to enable synthesis of findings in future studies.

Study II consisted of a systematic review of the world-wide literature. Although the review question could not be answered, the systematic review provided valuable information and guidance for future research and practice. The conclusions contribute to the body of knowledge by providing useful information to the evidence gap that has been identified.

Chapter 6

Study III

Title: A mixed-methods exploration of OIHD in wet workers in NHS Grampian

6.1 Introduction to the chapter

Study I provided a review of the national and local databases of the reported period prevalence of OIHD in wet workers and particularly amongst wet workers in the UK and Grampian region between 2010 and 2015. The findings indicated small numbers of period prevalence both nationally and locally. An annual increase of incidence and prevalence rates was observed within NHS Grampian's OHS skin surveillance scheme, which warranted further attention. Moreover, some occupational groups had significantly higher proportions of pre-existing skin conditions.

In Study II of this thesis, a systematic review of the world-wide literature was undertaken using the Joanna Briggs Institute (JBI) approach. The systematic review identified a plethora of evidence in relation to preventing OIHD. However, there is currently a lack of high quality evidence relating to the primary prevention of OIHD. This is not to imply that the current interventions are ineffective but that the available evidence is insufficient in ascertaining the effectiveness of interventions for the primary prevention of OIHD. In the researcher's view, the literature gap highlighted the importance of high quality evidence (i.e. being able to identify the existence of previous skin conditions when investigating mixed populations at risk of developing OIHD).

The findings of Study I and II indicated the need for developing a mixed methods approach to explore the distribution and possible determinants of OIHD and to identify evidence through the wet workers' experiences and attitudes on how best to prevent the condition. Study III involved two forms of data:

i) quantitative data collected using a standardised questionnaire specific to skin allowing identification of HCWs with pre-existing skin conditions and
ii) qualitative data collected through semi-structured interviews enabling identification of barriers to OIHD prevention and methods to improve implementation of workplace prevention.

6.1.1 Aims

The aims of Study III were:

(i) to explore the distribution and determinants of OIHD in a sample of wet workers referred to OHS in NHS Grampian in 2015 and

(ii) to explore the demographics of the sample as well as experiences, perceptions and needs of wet workers in relation to prevention of OIHD using a mixed methods approach.

The outcomes of this study will provide evidence with the potential to enhance the health and wellbeing of wet workers, and will inform the design of a robust intervention, to follow on from this research.

6.1.2 Research Questions

The specific research questions were:

(i) What are the socio-demographic and occupational history characteristics of the wet workers who have been referred to NHS Grampian OHS for various health issues (including skin) in 2015?

(ii) What is the distribution and the nature of the determinants of OIHD on hands and wrists/forearms amongst the wet workers referred to NHS Grampian OHS for various health issues (including skin)?

(iii) Is there an association between OIHD (on hands and/or wrists/forearms) and the development of atopic symptoms in the sample of wet workers referred to NHS Grampian OHS for various health issues (including skin)?

(iv) What are the experiences, attitudes and self-perceived needs of wet workers in NHS Grampian around how best to prevent OIHD?

6.2 Methodology

A mixed methods approach mapped to the pragmatic paradigm was employed for Study III. Both quantitative, and qualitative data, were used: i) to understand (as accurately as possible) and ii) to identify more comprehensive evidence and answers through the wet workers' experiences and attitudes of how to best prevent OIHD.

6.3 Methods

The mixed methods design that best reflected the research problem in Study III was the explanatory sequential approach (Creswell and Plano Clark 2011). Discussion regarding the justification of this design took place in chapter 3 (pages 68-71). The researcher first conducted quantitative research aimed at identifying the nature of the discoveries from this approach - expanse of the OIHD phenomenon, number of wet workers affected, distribution and determinants of OIHD (Creswell 2014). The discoveries from the qualitative research would then describe how OIHD affects wet workers. In particular, Study III comprised a six-month mixed methods approach that employed an epidemiological retrospective survey (quantitative) followed by semi-structured interviews on a sub-sample of respondents (qualitative). These two interactive studies enabled the researcher to interpret and explain the findings in more depth. Further, the combination of the results from both studies will enable the researcher to identify the key domains that can then be used to develop the appropriate intervention. The section that follows provides an in-depth discussion of the quantitative and qualitative methods employed in Study III.

6.3.1 Quantitative Approach

Questionnaires

Oppenheim (1992) described questionnaires as important instruments in research for collecting data and assessing, quantifying and measuring attitudes. Systematic and thorough data collection is fundamental in epidemiological studies. The modes of data collection are determined by factors such as the characteristics of the population, the available resources and the sensitivity of the topic to be examined (van Gelder, Bretveld and Roeleveld 2010). Face-to-face or telephone interviews, paper-and-pencil questionnaires have been traditional epidemiological methods of data collection. While the use of internet for self-report data has been increasing in the past decade, web-based questionnaires are still raising concerns in epidemiologic research with regards to the reliability of data collected and selective nonresponse (van Gelder, Bretveld and Roeleveld 2010). Web-based questionnaires, however, offer numerous advantages, such as flexibility of presentation, ease of administration, low cost, immediacy of results and elimination of data errors, have the potential of becoming very powerful tools (Booth-Kweley, Larson and Miyoshi 2007; Sills and Song 2002). Successful use of web-based questionnaires in large cohort studies such as the Nurses and Midwives e-Cohort and the Danish Web-Based Pregnancy Planning Study are examples of the benefits and possibilities they can offer (Mikkelsen et al. 2009; Turner et al. 2009). The Nurses and Midwives e-Cohort success in recruiting a large-scale population confirmed the feasibility of using internet-based questionnaires in large population-based epidemiological research (Turner et al. 2009). The latter study, offered the prospect of linking information collected from the cohort participants to data registries, relating the information to other exposures and outcomes (Mikkelsen et al. 2009).

The quantitative approach of Study III aimed to capture a large sample of the NHS Grampian HCWs population in order to investigate the distribution and determinants of OIHD in the organisation. Moreover, this sample would provide a sub-sample where in-depth interviews would further explore the views and experiences of wet workers exposed to wet work with the aim to develop an evidence-based intervention. In Study III quantitative data was obtained using the Nordic Occupational Skin Questionnaire (NOSQ-2002/SHORT), a specialised tool for surveying work-related skin diseases and exposures (Susitaival et al. 2003). Using a standardised questionnaire was beneficial in terms of ensuring validity and reliability of the measurements made (Bolarinwa 2015). The questionnaire was incorporated on a web-based format for the participants to access online. SurveyMonkey®, an online survey software, was used for this purpose. Paper copies of the NOSQ-2002/SHORT were also used for the employees with no NHS Grampian email. Statistical analysis using SPPS software was carried out as the key variables in the quantitative approach of Study III were categorical.

6.3.2 Qualitative Approach

Interviews

Interviews can be used to collect both qualitative and quantitative data following different structures which is typically dictated by the research design and purpose (Gerrish and Lathlean 2015). There are three main interview types: i) structured where the use of a questionnaire is the data collection tool, ii) semi-structured where an interview schedule is employed to collect data and iii) unstructured where the interview is most in-depth and least directive; usually a few topic themes guide the interview, and these will be used to collect the data (Oppenheim 1992). Structured interviews are usually adopted in survey studies where less in-depth data is required. For example, during the quantitative approach of Study III a standardised questionnaire (NOSQ-2002/SHORT) was administered to gain a better insight of the problem and also identify an appropriate sub-sample for the qualitative approach within Study III. Semi-structured interviews are commonly used qualitative methods in health research including nursing research (Gerrish and Lathlean 2015). Various methodological approaches can be adopted to gain in-depth data on a range of phenomena, understand context as well as illuminate responses following a questionnaire survey (Gerrish and Lathlean 2015). Hence, the qualitative data of Study III were obtained from semi-structured interviews in order to explore key issues highlighted in the quantitative approach of Study III in greater depth. Moreover, the findings of Studies I, II and the quantitative approach of Study III, allowed the researcher to predetermine the interview schedule topics and develop open-ended questions in order to follow on the issues identified and raised by the participants. Finally, unstructured interviews aim to investigate and achieve breadth and depth of subject of interest (Ritchie et al. 2014). This approach is commonly adopted in research studies where little previous knowledge exists around the subject matter (Gerrish and Lathlean 2015). Individual interviews typically take place face-to-face (Gerrish and Lathlean 2015). The merits of face-to-face interviews are that the researcher can observe non-verbal behaviours (facial expression and body language) and make eye contact with the participant both of which can help the researcher better interpret what is being said (Bowling 2014; Gerrish and Lathlean 2015). Moreover, the researcher is able to respond accordingly when the interpretation concerns emotional reactions such as stress, anxiety, distress or silence (Bowling 2014). Qualitative research however, has been embracing telephone interviewing to conduct both structured and semi-structured interviews (Gerrish and Lathlean 2015). Telephone interviews although limited in their ability to detect nonverbal cues have many advantages; they are cost-effective (requiring less time and resources for travelling), the equipment needed is minimal and the quality of responses, especially in structured interviews is not compromised (Gerrish and Lathlean 2015; Midanik and Greenfield 2003). In 2001, Garbett and McCormack conducted telephone interviews as part of a qualitative research project amongst 26 nurses across the UK (Gerrish and Lathlean 2015). Aside from reducing travel costs, conducting telephone interviews also reduced the pressure of participation and commitments to the research project (Garbett and McCormack 2001). Both face-to-face and telephone interviews are valid and accurate tools for data collection in research studies with different strengths and limitations. Response rates, data fidelity and resource utilisation are significant factors to consider when deciding between telephone and face-to-face interviews. Method choices should be made on the basis of increasing accuracy in data collection and decreasing error/bias as well as making an informed decision based on the study design (Rahman 2015). In Study III, the participants were given the freedom of choice between a face-to-face (interviews were to take place in the hospital campus) or a telephone interview due to the nature of their work patterns. Given that HCWs traditionally work on rotation (day and night duty) usually doing 12 hour shifts, minimum disruption of their work and leisure time was the main reason behind offering the option between telephone and face to face interviews. Semi-structured interviews were carried out for the purposes of the qualitative approach in Study III. The rationale for employing semi-structured interviews was for the interviewer to be able to hold control over the themes/topics that emerged from the outcomes of Studies I and II so they are addressed during the interviews. The best way to achieve that was by designing a semi-structured interview schedule that employed closed and open-ended questions to provide the interviewees with the opportunity to discuss and share their thoughts, opinions and experiences. Moreover, another benefit of using semi-structured interviews was that it allowed the researcher to use mixed methods by incorporating quantitative and qualitative elements in the interview schedule. This enabled capturing and adroitly bridging the gap created by solely utilising quantitative or qualitative methods when exploring the views, thoughts and experiences of HCWs in regards to skin health and care at the workplace. The interview data were transcribed verbatim by the researcher which enhanced familiarity with the data and allowed the commencement of the analysis process (Bergin 2018).

6.3.3 Sampling

Methods for selecting an appropriate study sample comprise a very significant field in statistics. Various sampling methods are being used in both quantitative and qualitative research and they are dictated by the specific research questions and /or stated study hypothesis (Bhopal 2002; Dos Santos Silva 1999). The two major categories of sampling methods are random and non-random sampling (Bowling 2014).

Random Sampling

Random sampling methods assure each unit within a population has an equal probability of being selected (Bowling 2014). Random sampling methods enhance the representativeness of the study population which consequently benefits generalisability of the findings to the population (Bhopal 2002; Dos Santos Silva 1999). Table 6.1 illustrates random sampling methods as outlined by Bowling (2014).

Table 6.1 Random Sampling

Sampling	Description
Unrestricted Random Sampling	Each participant has equal chance of selection from a draw of random numbers which is being replaced before the next draw
Simple Random Sampling	Random selection of participants from a database
Systematic Random Sampling	Participant selection has a starting point followed by set intervals afterwards
Stratified Random Sampling	Population is divided into strata where participant selection is carried out using simple or systematic random sampling
Cluster sampling	Participants are selected from a population's sub-set
Multistage sampling	Participants and research sites are selected at random
Sampling with probability proportional to size (PPS)	Participants and research sites are selected at random but when the primary sample unit has a larger population than another then it is given twice the chance to be selected

Non-Random

Non-random sampling methods are often employed by research studies that aim to investigate associations between key variables (Bhopal 2002). Non-random sampling results are not representative of the population, therefore, generalisation of findings is not feasible (Bowling 2014). Non-random sampling has increased potential of bias associated with the researcher's criteria for selecting participants. For example, the researcher's unconscious selection of certain types of participants based on participants' availability or likelihood of inclusion (Bowling 2014). Table 6.2 illustrates the non-random sampling methods as described by Bowling (2014).

Table 6.2 Non-Random Sampling

Sampling	Description
Quota	Non-random stratified selection of participants within a geographical stratum
Convenience	Participants are recruited on the basis of convenience e.g. easy to recruit, likely to respond
Purposive	Deliberate and non-random selection of participants based on the researcher's judgement
Snowball	The researcher recruits a small sample of participants, who are then asked (by the researcher) to recruit others also in the target group
Theoretical	Participants are identified by the researcher during the research process while hypothesis and theoretical categories emerge

The sampling methods deployed in Study III were: i) a purposive sample for the quantitative approach and ii) a convenience sample for the qualitative approach. The purposive sample was selected as the most appropriate method in order to focus on socio-demographic characteristics of HCWs and to survey work-related skin disease which would then enable the researcher to elicit useful information to answer the research questions. Further, the purposive sample provided the researcher with a convenience sub-sample which allowed her to facilitate in-depth exploration of key findings that emerged from the quantitative approach.

6.3.3.1 Quantitative Approach

Population and sample

The population for this study consisted of NHS Grampian HCWs exposed to risk of developing OIHD through wet work as part of their day-to-day practice. A purposive sample was employed for the quantitative approach in Study III. The sample of HCWs had been referred to OHS for any health problem including skin issues between the period 01/01/2015 and 31/12/2015. That included registered nurses, midwives, healthcare support workers, allied healthcare professionals, medical and dental staff, domestics, estate workers and administration staff. Evidence suggests that clients of occupational health services provide a source of information for prevention practices in their workplaces (Holness and Kudla 2012). The sampling frame (Figure 6.1) of the quantitative approach of Study III consisted of three types of referrals: (i) management referrals (self and management referrals for any kind of health issue), (ii) skin referrals (self or management referrals specific to skin-related issues) and (iii) OHS skin health surveillance scheme (referrals from the annual OHS skin surveillance scheme).

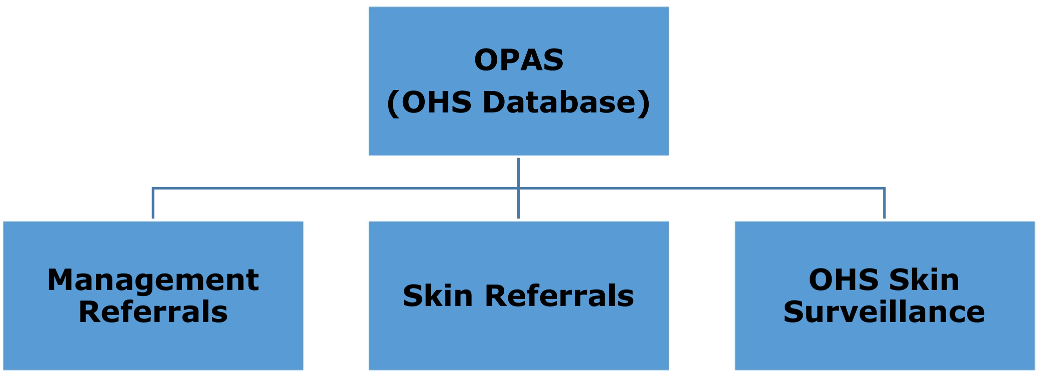


Figure 6.1: Sampling frame of the quantitative approach

The researcher categorised the total of the wet workers' referrals into two groups: Group A consisting of skin-related issues and Group B consisting of any other kind of health issue. In this way, the recruited sample consisted of a mixed population of NHS Grampian wet workers who have been referred to OHS for various health reasons including skin-related issues. This was aimed to target all wet workers with or without skin declarations or pre-existing skin conditions and allowed gathering of comparable information on skin disease in different populations. Wet workers' data was extracted from OPAS, and was copied onto a Microsoft Excel spreadsheet. A letter (see appendix 6.5) inviting the participants to take part in Study III and the participant information sheet (see appendix 6.3) were emailed to the wet workers who had a NHS Grampian email address via the OHS generic email on behalf of the OHS consultant.

Data collection

Quantitative data was obtained through the Nordic Occupational Skin Questionnaire NOSQ-2002/SHORT version, which is a specialised and standardised tool for surveying work-related skin diseases and exposures to environmental factors (Susitaival et al. 2003). The development of this tool was mainly financed by the Nordic Council of Ministers (Flyvholm et al. 2002). Two versions of the questionnaire are available; NOSQ-2002/SHORT and NOSQ-2002/LONG. The short version is a ready-to-use tool for screening and monitoring occupational skin disease on hands, wrists and forearms, whereas the long version provides an added pool of questions/question sets that can be used for a specific study (Flyvholm et al. 2002). The NOSQ-2002/SHORT was the most appropriate version to use in order to fulfil the purposes of Study III. Firstly, it was not necessary to conduct a more detailed survey at this stage by using the full-length questionnaire. That was because Study III was underpinned by an explanatory sequential design which meant that the key findings of the NOSQ-2002/SHORT would be discussed more in-depth during the semi-structured interviews which intended to follow. Secondly, the use of the short version was appropriate to function as a sampling frame for the qualitative approach which followed. The questionnaire could be publicly accessed via the internet and it was available in various languages including English; therefore, no translation was required. Paper copies of the questionnaire were sent to those who had no NHS Grampian email (for example, domestics). Free post envelopes were provided to the participants for returning the printed questionnaires to the researcher at Robert Gordon University.

Inclusion criteria

The OHS database OPAS was used for the purposes of Study III. NHS Grampian employees who had been referred to OHS for various health reasons including skin issues between 01/01/2015 and 31/12/2015 and were exposed to risk of wet work were selected. The selection process was carried out in the same way as in Study I, by the researcher. Using the 'report runner' command within the OPAS software to extract the data, employees were selected by choosing episodes of the type 'management referral' or 'skin referral' or 'self-referral' for export. Moreover, parameters and identifiers such as employment status, occupation, work type, business unit and department were used to filter the data according to the exclusion criteria. This process was carried out with the assistance and presence of an OHS colleague who was specially trained to operate these SQL commands in the OPAS software. In this way, the researcher ensured that bias was reduced, the selection criteria on OPAS were cross-checked and human error was minimised.

Wet workers were considered NHS Grampian employees who carried out wet work (frequent hand hygiene, wearing occlusive rubber gloves, coming in contact with chemicals contained in soaps and hand disinfectants) as part of their day-to-day job. In order to determine which employees on OPAS fulfilled the above criteria, the researcher selected the employees based on the information available from their OPAS employment field which provided the following details: employment status (clinical or non-clinical), occupation (nurse, doctor, domestic), work type (acute, community), shift (12-hour shift). Determining whether a HCW is a wet worker or not could not be ascertained only by the staff group classification on OPAS. Appendix 6.6 illustrates the NHS workforce by staff group at a local and national level. Although there are some minor differences regarding the job families between the two, the majority of the staff groups are the same. Within each of the staff groups there would be HCWs that would perform wet work, however, it would only be feasible to ascertain it by using further identifiers on OPAS.

By using the identifiers on OPAS mentioned above, as well as setting date limits (01/01/2015 to 31/12/2015) the researcher was able to identify which of the employees would perform wet work as part of their day-to-day job in exactly the same manner as in Study I. The types of participants were wet workers employed by NHS Grampian. That included: registered and not registered nurses, midwives, healthcare support workers (HCSWs), allied healthcare professionals, medical and dental staff, domestics, estates workers, administration and senior management.

Exclusion criteria

To avoid contamination of the preliminary data the following groups were excluded for the purposes of this study; bank staff, locum specialties, students (including students from nursing, midwifery, health sciences, pharmacy, medical and dental), non-clinical staff (e.g. clerical staff). Although some of these groups of employees were wet workers, they were excluded from the quantitative approach of Study III, as the frequent and short-term rotation in various areas of work would prevent the researcher from identifying accurately high risk areas or other factors of OIHD, including sufficient exposure to wet work hazards.

Research Governance

As mentioned in Chapter 4, according to the NHS Health Research Authority, guidance research on NHS staff does not require ethical approval from the UK's NHS Research Ethics Committee (NHS Health Research Authority 2019). Approval from Research and Development (R&D), however was required for conducting research within the NHS. Approval for this study was granted by:

- Robert Gordon University: School of Health Sciences School Research Review Group (SRRG) with reference number: SHS/16/18 (appendix 4.1)
- NHS Research and Development department with reference number: 2017RG001 (appendix 4.2)
- NHS Grampian Gatekeeper and Caldicott approval was granted from the NHS Grampian Head of Occupational Health and Safety, the OHS Nurse Manager and the Data Governance manager (appendix 4.3)

The recruitment of participants included consecutive referrals who meet the inclusion criteria without accessing any other personal data held in OPAS except the participant contact details such as NHS Grampian e-mail address or home address. The consultant of OHS acted as the gatekeeper and an invitation letter was sent by her via e-mail and post (for the staff who do not have an NHS

Grampian email address) to all the wet workers that met the inclusion criteria prior to any contact from the researcher. A printed version of the same letters including a printout of the questionnaire was sent via post to the wet workers who did not have a NHS Grampian email address. All wet workers who were notified by the gatekeeper (OHS consultant) were then invited in writing (letter or email format) to participate in this study by filling in the standardised questionnaire (NOSQ-2002/SHORT) and were sent the following documents (see Figure 6.2):

i. participant information sheet
ii. the online link required to fill-in the online questionnaire
iii. a printed version of the questionnaire was sent to participants who had no NHS Grampian email address and free post envelopes were provided to the participants for returning the printed questionnaires to Robert Gordon University.
iv. non-participant form (aiming to obtain feedback of why participants did not wish to take part in order to allow improvement for future studies).

Two email reminders were sent at two week intervals (from the date of the initial invitation) to the participants who had NHS Grampian email addresses and the electronic survey remained open for access until the end of October 2017 in order to allow enough time for the individuals to respond. The survey took place between the 22nd August 2017 and the 31st October 2017. The researcher ensured that the electronic survey was open until the end of October to allow time for more responses taking into consideration that during August NHS Grampian employees could be on annual leave and to also give the chance to those who may have been on sick leave during the time of the survey. Another factor that was taken into consideration for time allowance was that the nature of work in the healthcare sector is predominantly clinical and access to computers/emails is restricted in the wards/community/theatres etc. For those wet workers who did not have an NHS Grampian email address one reminder letter was posted to their home addresses due to limited resources for further than two contacts via post.

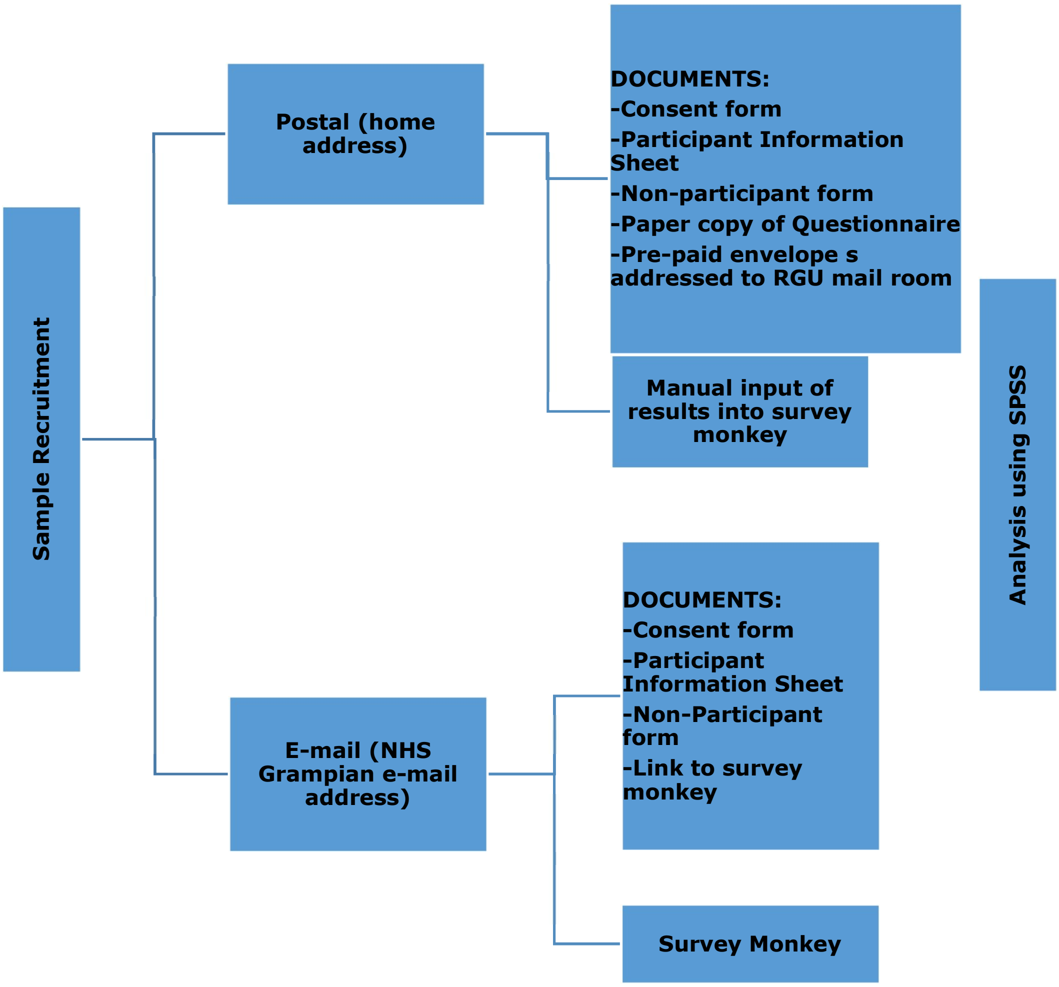


Figure 6.2: Sample recruitment of the quantitative approach

Procedure

The data extracted from OPAS, consisted of the wet worker's unique PIN number (which is de-identified data), occupation, area of work, department/zone and their contact details (NHS Grampian email address and home address for those employees with no NHS Grampian email address). Using a specific to OPAS software command called 'report runner' on OPAS, the researcher was able to identify and carry out the first data exportation by selecting the two episode types of interest; management referral (including skin surveillance cases and skin referrals) and self-referral. Moreover, parameters and identifiers of such employment status, occupation, work type, business unit, and department were used for the report runner in order to apply the exclusion criteria (bank staff, locum specialties, students (nursing, midwifery, health sciences, pharmacy, medical and dental). The process of extracting the wet workers' data from OPAS via report runner was carried out with the assistance and in the presence of the NHS Grampian OHS administration manager and another colleague specially trained to operate such commands on OPAS. In this way, the researcher minimised human error, reduced bias and ensured the selection criteria on OPAS were cross checked.

As discussed earlier in this chapter the Nordic Occupational Skin Questionnaire (NOSQ-2002/SHORT) was the most appropriate version to be used to survey NHS Grampian wet workers who have been referred to OHS for any health issues including skin issues in 2015.The NOSQ-2002/SHORT was incorporated manually by the researcher on a web-based format for the participants to access online. To fulfil this purpose an online survey software called SurveyMonkey® was used and the link to the electronic survey was sent via email to the wet workers with NHS Grampian email addresses. The SurveyMonkey® link was accessible on desktop, tablet and/or mobile telephone devices. For the postal questionnaires returned, the researcher manually inputted the responses into SurveyMonkey® so that all the quantitative data were in the same format (electronic) to allow data analysis. All the questions of the NOSQ-2002/SHORT were coded in the exact same way in both electronic and paper formats in order to reduce the risk of error during the manual input of the data.

Data Coding

Data coding is a method of conceptualising research data and classifying them into meaningful and relevant categories for the participants in the survey (Bowling 2014). In order to be able to examine the sample in more detail as well as to be able to conduct a more comprehensive statistical analysis and presentation of the results some of the survey data were coded. The NOSQ-2002/SHORT questionnaire consisted of 15 open and closed questions, some of them being multiple-choice. To best reflect and capture the questions and the answers of the NOSQ-2002/SHORT questionnaire, 46 variables were created on SPSS as there is no standardised method or guidance for data analysis of the NOSQ-2002/SHORT. The table 6.3 below illustrates the aggregated occupational groups that were used in Study III:

Table 6.3 Occupational Groups Aggregated

Occupational Groups Aggregated
Medical Practitioner: MD Consultant, specialist registrar, associate specialist, speciality doctor, foundation house officer
General Practitioner: GP GP and GPST
Nursing/Midwifery (qualified and unqualified): NM Nurse, midwife, nurse assistant, auxiliary nurse, ancillary nurse, healthcare support worker, housekeeper
Medical Support: MS Theatre orderly
Administrative Services: AS Administration
Allied Health Professionals: AHP Physiotherapist, occupational therapist, dietician, radiographer, podiatrist
Support Services: SS Porter, security, domestic, estates and maintenance, care assistant
Healthcare Sciences: HS Biomedical scientist, clinical scientist
Other Therapeutic Services: OTS Psychology, psychiatry, pharmacy
Dentist/Dental Support: DDS Dentist, dental officer, dental nurse, oral health
Pharmacists Pharmacists and pharmacy technicians
Personal and Social Care Health coaches
Senior Management: SM Clinical researcher, general management services, nursing manager
Others Clinical assistant, other support worker

There were two question sets in NOSQ-2002/SHORT that concerned exacerbating factors at and outside work. As these two questions were open the researcher coded the responses into the categories shown in the table 6.4 below.

Table 6.4 Exacerbating Factors At and Outside Work

At Work	Outside Work
Soaps and Cleaners (liquid soap, surgical scrub, hand gel)	Soaps and Cleaners (cleaning products, washing powders)
Wet Work (frequency of hand washing, length of time wearing gloves and frequency of wearing gloves)	Wet Work (frequency of hand washing, length of time wearing gloves and frequency of wearing gloves)
Hand Hygiene Technique (drying hands)	Hand Hygiene Technique (drying hands)
Chemicals and other materials (latex)	Chemicals and other materials (latex)
Personal Protective Equipment (gloves sterile and examination, gowns)	Personal Protective Equipment (rubber gloves)
Detergents (detergent wipes, actichlor, glutaraldehyde)	Detergents (detergent wipes, actichlor, glutaraldehyde)
Nickel	Nickel
Fragrances and Cosmetics	Fragrances and Cosmetics
Solvents (plaster of paris)	Solvents (plaster of paris)
Temperature (hot and or cold)	Temperature (hot and/or cold)
Animals	Animals (cats, horses)
Mites (dust)	Mites (dust)
Unknown (unsure which substance is causing the symptoms, awaiting diagnosis)	Wool
	Plants (grass, aloe vera)
	Foods (peeling potatoes/tomatoes)
	Acrylics (paint)

Data Cleaning

Once the data was exported from SurveyMonkey® into SPSS in order to eliminate obvious errors, further data cleaning took place through a specific set of instructions in the SPSS programme. The instructions looked for missing values, range checks, skips and checks for inconsistency (Bowling 2014).

The following errors were identified after these instructions were run in the programme:

(i) A total of three cases were excluded that were missing answer on Question 1 (did not provide consent to take part in the survey).

(ii) A total of four cases were excluded that were identified as bank staff (exclusion criteria). These four cases should not have been contacted to take part in the survey as they did not meet the inclusion criteria. It appears that the details of these four participants held on OPAS database at the time the survey were out of date and, therefore, were not excluded at the selection stage.

(iii) A total of 67 cases were excluded as they declined to take part in the survey. Out of the 67 cases, 17 cases (4 postal and 13 electronic) declined to take part in the survey without providing feedback. The remaining 50 participants provided feedback. The reasons for declining to take part in the survey were:

- lack of time (18),
- retired (15),
- no longer employed in NHS Grampian (9),
- other reasons (for example, *'…never had any problems with my skin...')* (4) and
- deceased (4)

For the four cases that were deceased the principal supervisor of the researcher contacted the families to apologise for disturbing them and causing any inconvenience and thanked them for taking the time to write back to inform about their relatives.

In total, 74 cases were excluded and deleted from SPSS due to the aforementioned reasons. The resulting sample size following the above data cleaning process was 369. As discussed previously in this chapter and also in chapter 4, the OPAS database was not a live database; therefore, the information on the database was not updated to reflect changes in the employment status of the participants. This limitation will be discussed further in the discussion chapter.

Missing data

There are typically two types of missing values:

i. when a question has been left deliberately blank/unanswered
ii. when a reply was expected but not given also known as an inadequate response (Pallant 2016; Bowling 2014).

Out of the 369 responses following the data cleaning, 60 cases gave no responses to any of the survey questions despite the fact that they have given consent to take part in the survey (answered only the first question of the survey), and these cases were deemed as missing cases for the purposes of data analysis. The valid total sample for data analysis of the survey was, therefore, 369 cases. No missing value analysis was carried out for the 60 missing cases since the participants failed to answer all the questions that followed the first question (consent to take part in the survey) of the survey. In order to provide the freedom of choice to answer or to not answer a question, no logic was applied to the questions in the SurveyMonkey®; this meant that the participants could skip a question or progress to the next question without having to provide an answer to the previous question. Such freedom of choice was available for the participants who filled in the postal survey therefore all participants were surveyed equitably. As a result, there were missing values in all of the 15 questions of the SurveyMonkey® as well as the postal questionnaires since many participants omitted to answer all the questions.

Analysis

Statistical analyses were carried out using IBM SPSS (version 25). For continuous variables, the values were expressed as means and medians and for nominal variables as frequencies. Statistical comparisons were made for continuous variables using parametric tests. For nominal variables, the Chi-square test was applied to test the null hypothesis of no association at a p-value of less than 0.05. Data was directly imported into SPSS for analysis via the SurveyMonkey® online link (available option of the software). The data collection via the NOSQ-

2002/SHORT questionnaire allowed the researcher to measure the occurrence of OIHD on hands and wrists/forearms in different age groups, genders, occupations and length of employment. Moreover, exacerbating factors in and outside work were explored in relation to hand and wrist/forearm eczema as reported by the wet workers.

6.3.3.2 Qualitative Approach

Population and sub-sample

Participants who had volunteered to take part in an interview following the completion of the Nordic Occupational Skin Questionnaire (NOSQ-2002/SHORT) formed the sub-sample of the qualitative approach of Study III. This convenience sub-sample consisted of participants who volunteered and were willing to take part in the semi-structured interviews. This method was chosen as the most appropriate for practical reasons; it was easy to recruit within the time-limits and resources of this DPP project and the participants were likely to respond (Bowling 2014). The value of this method is limited; however, it can be used in order to obtain early information for the field of interest (Ritchie et al. 2014). Further, convenience sampling has also been used for exploring valuation of health states. For example, in utility research which is concerned with how one develops knowledge that can be directly used for improving practice convenience (Beutler and Howard 1998). Although this DPP project is not underpinned by utility research, the aspect of using the knowledge gained to improve practice is most relevant to the overall aim of the project.

The sub-sample of the qualitative approach in Study III was a convenience sample as it involved all the wet workers who volunteered to receive further information regarding taking part in the interviews. This sub-sample of wet workers also met the inclusion criteria after they filled in the Nordic Occupational Skin Questionnaire. The sub-sample (118) who requested further information regarding the interviews were emailed the participant information sheet (appendix 6.3). They were then contacted by the researcher either via a telephone call or an email (according to the participants' preference) to arrange a convenient format, date and time for the interview. The researcher offered a variety of times during the day (interview times could be any time between 08:00 and 20:00) and days (this included weekdays and weekends) to accommodate shift work patterns and offer flexibility to increase responses and engagement from the participants. Following this process, a sampling frame of 30 wet workers emerged. Figure 6.3 illustrates the sample recruitment.

Data collection

The researcher developed a semi-structured interview schedule (appendix 6.4). The interview schedule was developed prior to obtaining results from the NOSQ-2002/SHORT questionnaire. The findings from Studies I and II captured the main themes that the researcher wanted to explore further at the interview stage. These were the high-risk occupational groups and the opinions, views and experiences of HCWs on skin health and care at work with the aim to prevent OIHD. The findings from the NOSQ-2002/SHORT provided health information mainly regarding the sample which was useful in terms of skin health determinants for HCWs (including pre-existing skin conditions). Moreover, the NOSQ-2002/SHORT was used as sampling frame for the interviews.

The interview schedule was structured around five main topics; i) Hand Hygiene, ii) Skin Care, iii) Skin Issues, iv) Use of health services or self-help approaches for any skin issues and v) Thoughts on skin health and skin care at the workplace. The first four topics of the interview schedule contained predominantly quantitative questions in order to explore as accurately as possible the hand hygiene and skin care practices of the interviewees both at work and at home. The fifth topic of the interview schedule contained mainly qualitative questions which concerned the wet workers' views, beliefs and thoughts on skin health and care at work. The results will be presented later in this chapter and will also answer the research question for the qualitative part of Study III.

Qualitative data were obtained from semi-structured interviews in order to explore, in greater depth, key issues highlighted by the NOSQ-2002/SHORT questionnaire. At the end of the questionnaire in the quantitative approach, the participants were asked if they were willing to take part in an interview (the option for a face-to-face or a telephone interview was provided). Should the participants have wished to take part in the interviews they were instructed to fill in their personal details (name and contact details) in the next section of the questionnaire. The personal details of the participants who volunteered to take part in the interviews were then collated onto a word document which was securely stored electronically in the R/DRIVE (private research data drive with permission to be accessed only by the researcher and her supervisory team) of the Robert Gordon University.

Inclusion criteria

Responses to the questionnaire were collated and used to purposively select participants (Fink 2003). In order to provide a diverse sample, primary (declarations of skin issues and no declarations of skin issues) and secondary (gender, age group, occupation type) sampling criteria were applied.

Exclusion criteria

No further exclusion criteria applied for the purposes of data collection during the qualitative approach of Study III.

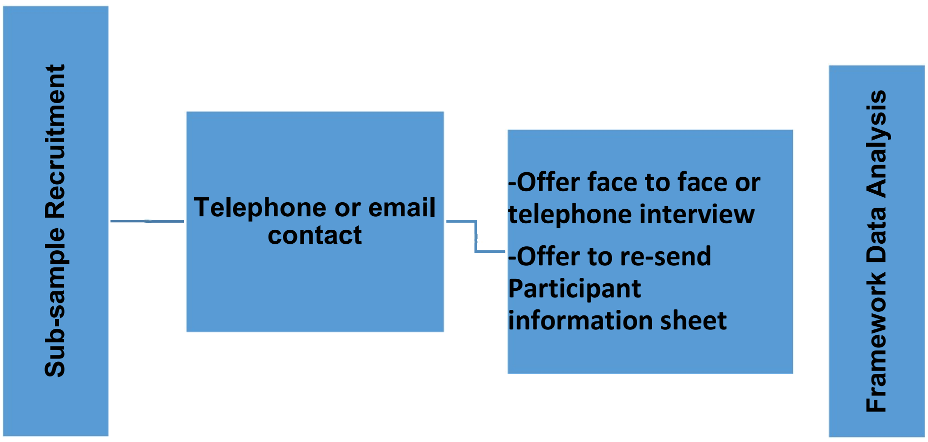


Figure 6.3: Sample recruitment of the qualitative approach

Procedure

Following the closing date of the SurveyMonkey® at the end of October 2017, the researcher identified a total of 118 participants who asked for further information regarding the interview and/or volunteered to take part. Out of 118 participants 57 had declared no issues with their skin on the survey and the remaining 61 claimed to have had skin issues. All 118 participants were contacted via telephone or email a maximum of two times (if the initial contact was not successful, for example, participants were not answering the telephone call or not replying to the email) in order to confirm if they were still wishing to take part in the study and arrange a convenient time and place for the interview. The participant information sheet was re-sent to all those participants (84) who requested further information. Out of the 118 participants a total of N=30 participants agreed to proceed with the interview. A courtesy email to thank all the 118 participants for volunteering to take part in this study was sent by the researcher. Out the 30 participants, three failed to engage for the interview after their interview appointments were rescheduled and two interviews were treated as pilot interviews to identify any possible issues with the interview schedule, therefore, 25 full interviews were conducted.

All the interviews were carried out via telephone call, which was the preferred choice of the participants. The researcher conducted all telephone interviews in a private office in Sir Ian Wood Building of Robert Gordon University in Aberdeen in December 2017. The interviews were audio recorded and then transcribed verbatim. All participants consented verbally for taking part in the interviews, for the conversation to be audio recorded and they also confirmed they had read the PIS. All the participants were informed in writing as well as verbally on the day of the interview that the interviews were confidential. The audio files were copied from the recording device onto the secure drive of Robert Gordon University server where access was only granted to the researcher and her supervisors. The audio files were deleted from the recording device once they were copied onto the drive.

Data Coding

Once the interviews were transcribed verbatim, a framework chart of the participants' interviews was developed using Microsoft Excel tables in order for the researcher to familiarise, construct an initial thematic framework, manage and index/sort the data. The interview schedule was structured around five main topics; i.) Hand Hygiene, ii.) Skin Care, iii.) Skin Issues, iv.) Use of health services or self-help approaches for any skin issues and v.) Thoughts on skin health and skin care at the workplace. These five sections were used in order to gain an overview of the content of the interviews and then to be able to code, identify elements and generate dimensions. Once the underlying elements have been identified, the researcher combined these elements into key dimensions. Further re-examination of the dimensions in combination with listening to the audio recording and reading the transcripts again yielded a higher order of classification for the topics of interest. Verification of the transcribed data and coding into elements, dimensions and classes was achieved by peer review from the principal academic supervisor.

Data analysis

There are various and different possible approaches to analyse qualitative data. Table 6.5 below outlines briefly some of the main qualitative analysis traditions.

Thematic analysis is a widely used approach as it is not associated with any particular discipline or set of theoretical constructs (Ritchie et al. 2014). Thematic coding has been used in other analytic traditions such as grounded theory due to its generic nature. The qualitative approach of Study III employed thematic analysis for the semi-structured interviews as it was deemed the most suitable approach to interpret, categorise data as well as to address the research questions that concerned Study III. Framework was used as analytic tool in order to achieve effective data management, including indexing, coding, data categorisation and higher-classification. The Framework analysis method provided a systematic tool for managing and indexing the data in a structured manner deemed appropriate for the interview data of Study III and in particular for summarising the data and generating themes (Gale et al. 2013). A range of merits underpinned the choice of using framework analysis for the qualitative approach in Study III as outlined by Smith and Firth (2011). Framework analysis i) allows the researcher to identify different aspects of the phenomena under investigation in cross-sectional descriptive data, ii) provides transparency during interpretation of participants' experiences and iii) allows a novice researcher to answer the research questions in a guided and systematic manner due to its structured nature (Smith and Firth 2011).

Table 6.5 Qualitative analysis approaches

Traditions of Analysis	Brief description
Ethnographic analysis	Descriptive analysis of the way of life of individuals or organisations
Life Histories	Single narrative analysis of collections of stories concerning common topics
Narrative analysis	Identification of the main story, focus on the structure of the narrative as well as the intention of the individual who tells the story and the nature of its audience as well as the meaning of the story
Content analysis	Identification of themes that emerge from the content and context of documents
Conversation analysis	Concerns the structure of a conversation as well as the classification of linguistic interactions
Discourse analysis	Focusing on knowledge production though distinctive language within a particular discipline. It can also concern on interactions of performances, rhetorical devices and linguistic styles.
Analytic induction	Identification of explanations and characteristics of a problem or phenomenon by repeatedly defining the problem, formulating and testing the hypothesis and then re-formulating the hypothesis or redefining the problem until the cases fit the hypothesis
Grounded theory	Generation of analytic categories and elements and identification of the relationships between them
Interpretive phenomenological analysis	Understanding how to make sense of the individual's own experiences and interpret their accounts, using established psychological concepts.
Thematic analysis	Discovery, interpretation and reporting of patterns and themes within the data at hand. Topics are being identified from the data that are progressively integrated into higher-order key themes with the main focus to address the overall research question.

Adapted from Ritchie et al. 2014

Data saturation in qualitative approaches

Data saturation was introduced in qualitative research by Glaser and Strauss in 1967 and became the gold standard in health sciences research (Francis et al. 2010). Data saturation occurs when no new analytical themes are emerging within a data set and consequently sampling is ceased (Bowling 2014). Sampling until data saturation is reached has been another important and relevant concept in health research. Francis et al. (2010) reported on the ambiguity in defining and justifying the concept in 18 papers. Francis et al. (2010) concluded that there is a need for further research to reflect on data saturation variations and based their recommendations around the following three areas:

i. predetermine and specify criteria of the study-wise data saturation in study protocols and then report the criteria in publications

ii. present data by using cumulative frequency graphs to achieve transparency and verify whether data saturation has been reached,

iii. develop an evidence-based protocol with regards to sample sizes for different types of interview studies.

Trustworthiness

The DPP project aimed to promote and ensure trustworthiness and rigour by employing the key criteria and provisions for trustworthiness during the qualitative approach in Study III. Shenton (2004) encourages qualitative researchers to address within Guba’s four criteria (credibility, transferability, dependability and conformability) the trustworthiness of the project by following generic strategies for each of these criteria. These strategies are summarised in table 6.6 below.

Table 6.6 Guba's Four Criteria for Trustworthiness

Quality Criterion	Possible provision made by researcher
Credibility	• Adoption of appropriate, well recognised research methods • Development of early familiarity with culture of participating organisations • Triangulation via use of different methods, different types of informants and different sites • Tactics to help ensure honesty in informants • Iterative questioning in data collection dialogues • Negative case analysis • Debriefing sessions between researcher and superiors • Peer scrutiny of project • Use of 'reflective commentary' • Description of background, qualifications and experience of the researcher • Member checks of data collected and interpretations/theories formed • Thick description of phenomenon under scrutiny • Examination of previous research to formulate findings
Transferability	• Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made
Dependability	• Employment of 'overlapping methods' • In-depth methodological description to allow study to be repeated
Confirmability	• Triangulation to reduce the effect of investigator bias • Admission of researcher's beliefs and assumptions • Recognition of shortcomings in study's methods and their potential effects • In-depth methodological description to allow integrity of research results to be scrutinised • Use of diagrams to demonstrate 'audit trail'

Adapted from Shenton, 2004

Credibility was achieved by:

i) using semi-structured interviews of closed and open-ended questions to elicit a range of information via different aspects of the topic under investigation and incorporating mixed methods elements to answer the research questions set in Study III (which complies with research studies in multidisciplinary health research)

ii) the sub-sample in the qualitative approach in Study III consisting of participants who volunteered to take part in the interviews following the completion of the NOSQ-2002/SHORT questionnaire during the quantitative stage of Study III

iii) establishing participant freedom to withdraw from the study at any stage by providing this information on the participant information sheet as well as by asking the participant prior to consenting in taking part in the interview

iv) assuring that frequent conversations and consultation between the researcher and the university principal supervisor took place before and during transcription of interviews

Transferability was achieved by describing the design of Study III, by the number of interviews achieved and by the types of participants who took part in the interviews.

Dependability was achieved by incorporating both quantitative and qualitative methods in order to capture breadth and depth around OIHD amongst HCWs. Findings were amalgamated so as to best answer the research questions that concerned both the approaches in Study III.

Confirmability was achieved by having the interview schedule content reviewed and validated by the university's supervisory team. The interview schedule was piloted in order to identify any flaws. Transcription and analysis of the interviews was reviewed and validated by the university principal supervisor.

The use of the framework tool also enhanced trustworthiness and allowed the researcher to achieve scientific rigour with regards to data analysis. The principal supervisor reviewed and confirmed the categories, themes and higher classification that emerged during data analysis.

6.4 Results

6.4.1 Quantitative

In 2015 (between the 1st of January and the 31st of December) 4,417 employees were referred to NHS Grampian OHS for any health issues including skin issues from which 4,072 were management referrals and 345 were self-referrals. In collaboration with the administration manager of the NHS Grampian OHS, the researcher identified a total of 2,700 wet workers' referrals on OPAS that met the inclusion criteria for Study III. Out of the 2,700 wet workers 2,048 had an NHS Grampian email address and 652 did not; they were therefore, surveyed by post.

Out of the 2,700 wet workers who were surveyed 443 responded (electronically and via postal questionnaire) providing a 16.5 % response rate.

Research Question (i)

What are the socio-demographic and occupational history characteristics of the wet workers who have been referred to NHS Grampian OHS for various health issues (including skin) in 2015?

The socio-demographic and occupational history topics of NOSQ-2002/SHORT included question sets that concerned the age, gender, years in present occupation (up to 2017) and years of major activity at work (wet work). These topics are explored below:

Age

With regards to the age profile of the sample, out of the total of 369 participants, 82% (301) provided an answer for their age and 18% did not (68 missing cases). Figure 6.4 shows the probability distribution of age for the sample.

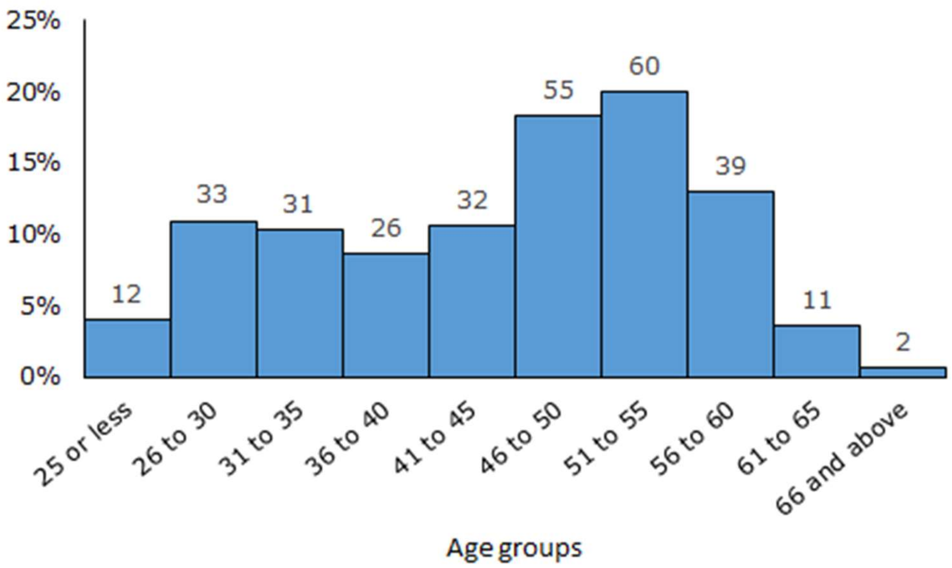


Figure 6.4 Age distribution

The age distribution appears to be bimodal and thus indicative of two distinct populations: those in their twenties to mid-forties, and those in their mid-forties or above. Table 6.7 below presents a summary of the statistics that concern the age distribution of the total sample.

Table 6.7 Statistics summary of age distribution

Mean	44.94
CI for mean	(43.69 - 46.20)
Median	47.00
Std. Deviation	11.05
Std. Error	0.64
IQR	19
Minimum	23
Maximum	70
N	301

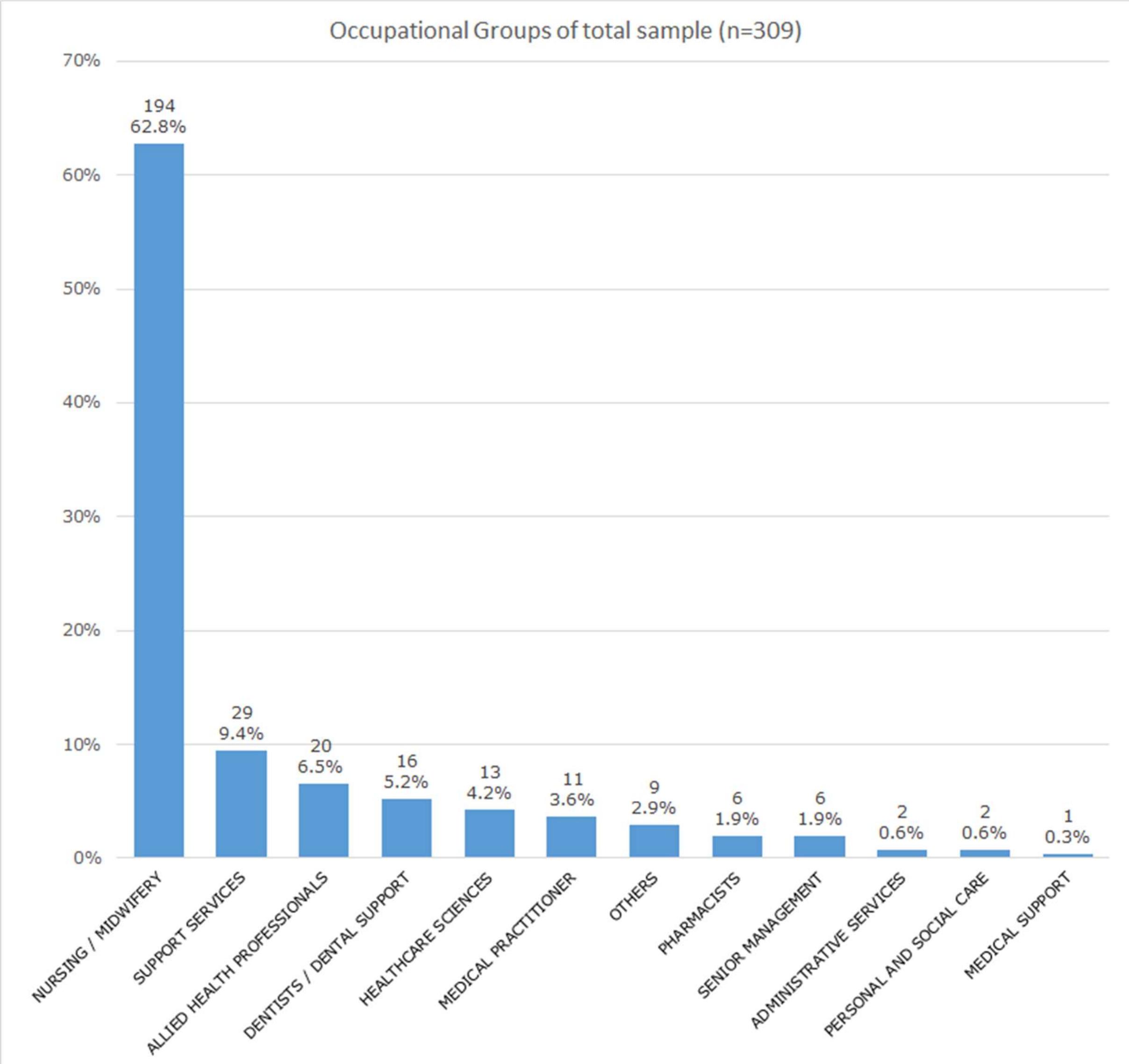
Gender

Out of the total sample of 369 participants, 84% (309) declared their gender in the survey, and 16% did not respond to the gender question (missing cases 60). The males were 13% (39 cases) and the females 87% (270 cases).

Occupational Groups charts

Figure 6.5 shows the occupational groups of the participants who took part in the survey. A total of 309 participants provided information regarding their occupational group. It is evident that the majority of the participants (194, 63%) belong to the nursing and midwifery occupational group. The following three occupational groupings are (i) support services (29, 9%), (ii) allied health professionals (20, 6.5%) and (iii) dentists/dental support (16, 5%).

Figure 6.5 Occupational Groups of the total sample



A total of 293 (79%) participants provided information regarding the years that they have been in their present occupation up to 2017, which was the year that this survey was carried out. Figure 6.6 below shows the tenure in present occupation up to 2017.

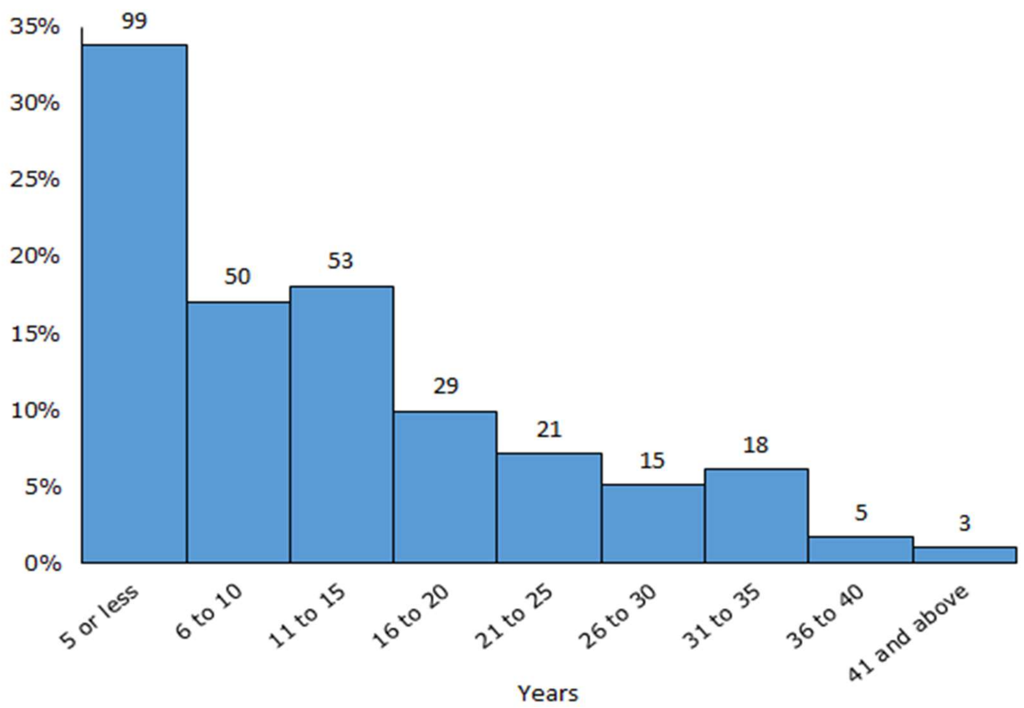


Figure 6.6 Tenure in present occupation (up to 2017)

Table 6.8 below presents a summary of the statistics that concern the tenure in present occupation up to 2017 of the total sample.

Table 6.8 Statistics summary of tenure in present occupation

Mean	12.61
CI for mean	(11.42 - 13.80)
Median	10.00
Std. Deviation	10.33
Std. Error	0.60
IQR	14
Minimum	.00
Maximum	43.00
N	293

Years of major activity

A total of 275 participants (74.5%) provided information regarding the overall number of years they have been carrying out wet work (prolonged or frequent contact with water in combination with soaps and/or detergents) as their major activity up to 2017 which was the year the data was collected for Study III. Figure 6.7 illustrates the activity years as declared by the participants.

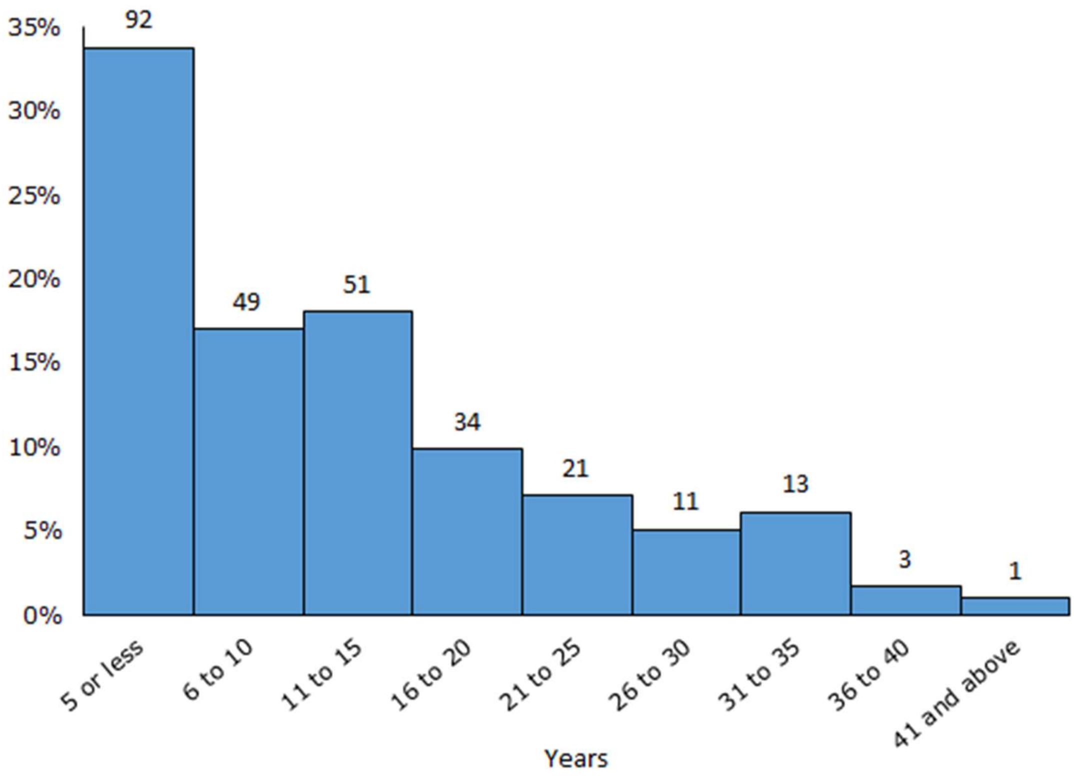


Figure 6.7 Major activity years histogram of the total sample

Table 6.9 below presents a summary of the statistics that concern the major activity years of the total sample.

Table 6.9 Statistics summary of major activity years

Mean	11.97
CI for mean	(10.86 - 13.08)
Median	10.00
Std. Deviation	9.35
Std. Error	0.56
IQR	13
Minimum	.00
Maximum	42.00
N	275

In summary, the socio-demographic characteristics of the NHS Grampian HCWs' total sample (301) revealed a distinct division in two major age-groups; participants in their twenties to mid-forties and participants in their mid-forties to seventies. The average years of the participants' current occupation was very similar to the average years of carrying out wet work (13 and 12 years respectively). A total of 12 occupational groups were identified in this study. Nursing/midwifery (62.8%), support services (9.4%) and allied health professionals (6.5%), were the most prevalent occupational groups the participants belonged to.

Research Question (ii)

What is the distribution and determinants of OIHD on hands and wrist/forearm amongst the wet workers referred to NHS Grampian OHS for various health issues (including skin)?

The NOSQ-2002/SHORT questionnaire included sets of questions regarding self-reported hand and/or wrist/forearm eczema as well as self-reported exacerbating factors in and outside work. In order to determine the distribution and determinants of OIHD amongst the NHS Grampian wet workers, due to non-response, there were 305 cases who gave answers to the questions regarding OIHD on hand/wrist/forearm. Out of the total of 369 participants, 82.7% (305) responded positively to these questions. Table 6.10 shows in detail the relationship between the two questions. It is observed that four participants declared having eczema only on wrist/forearm without having their hands being affected by it. On the contrary, participants who developed eczema only on their hands (and not on their wrist/forearm) were 49. The total of participants who had developed both hand and wrist/forearm eczema was 65.

Table 6.10 Eczema on hands and/or wrists/forearms

	Have you ever had eczema on your wrists or forearms?		
Have you ever had hand eczema?	**No**	**Yes**	**Total**
No	187 (97.9%)	4 (2.1%)	191
Yes	49 (43%)	65 (57%)	114
Total	236 (77.4%)	69 (22.6%)	305

Chi-square tests indicated that there was a significant association between having eczema on the hands and eczema on wrist/forearm (p-value <0.001).

It is therefore, suggestive that wet workers with history of hand eczema are more likely to also develop eczema on wrist/forearm. In the sub-sample of participants (118) who were identified as having declared hand and/or wrist/forearm eczema there were 13 males (11%) and 103 females (89%). There were two missing cases where there was no response to the question regarding gender. For the age variable, there was available information for 115 responders out of the total 118 (3 missing cases).

Figure 6.8 below presents the age frequencies of the sub-sample below it is evident that there are two major age groupings;

(i) twenties to mid-forties and

(ii) mid-forties to late sixties

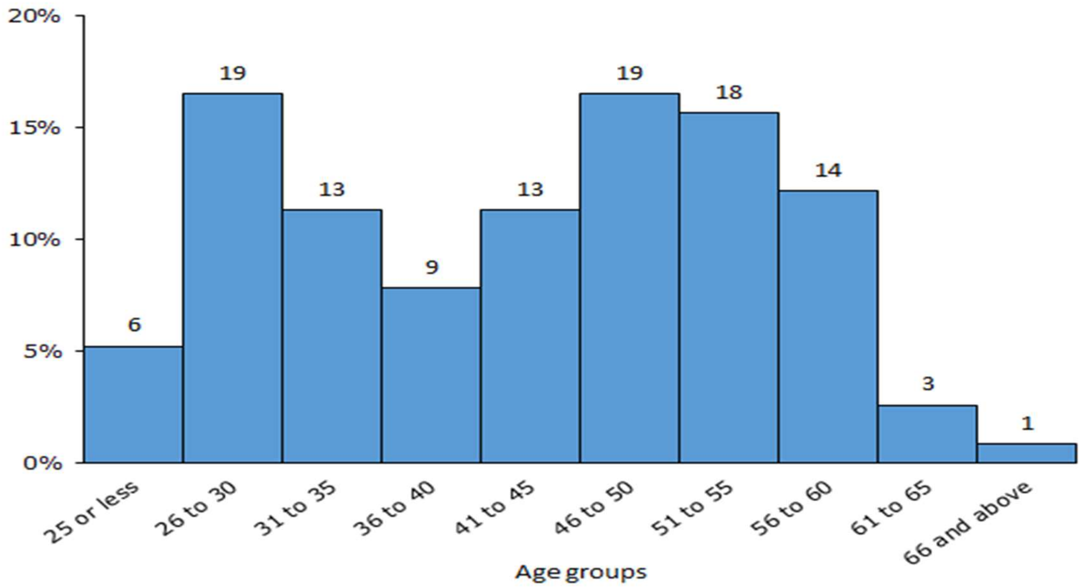


Figure 6.8 Age histogram of the sub-sample

Table 6.11 below presents a summary of the statistics that concern the age distribution of the sub-sample.

Table 6.11 Statistics summary of sub-sample's age

Mean	42.85
CI for mean	(40.69 - 45.00)
Median	44.00
Std. Deviation	11.65
Std. Error	1.08
IQR	20
Minimum	23
Maximum	68
N	115

In the sub-sample, 106 participants (12 missing responses) who were identified as having declared hand and/or wrist/forearm, declared the tenure in their present occupation. An illustration of tenure in present occupation up to 2017 is shown in figure 6.9 below where it is evidence that eczema on hands and/or wrist/forearm develops within the first decade of wet work.

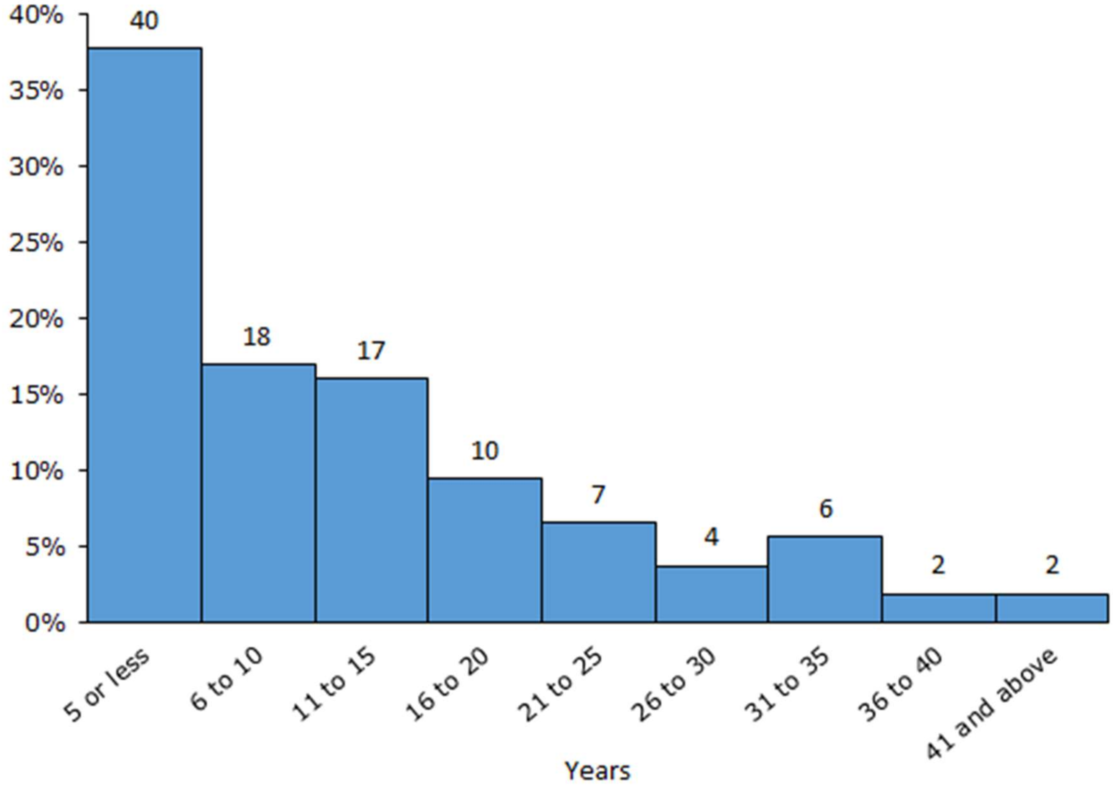


Figure 6.9 Tenure in present occupation of sub-sample

Table 6.12 below summarises the statistics that concern the tenure in present occupation of the sub-sample. This sub-sample (50%) had tenure of 10 years or less.

Table 6.12 Statistics summary of tenure in present occupation

Mean	12.61
CI for mean	(11.42 - 13.80)
Median	10.00
Std. Deviation	10.33
Std. Error	0.60
IQR	14
Minimum	.00
Maximum	43.00
N	293

Further to the above results, the overall years of wet work activity (how many years the participants have carried out wet work in total) was reported in the sub-group (103, 15 missing cases). An illustration of the activity years is shown in the histogram figure 6.10 below where it is evident that eczema on hands and/or wrist/forearm develops within the first decade of wet work.

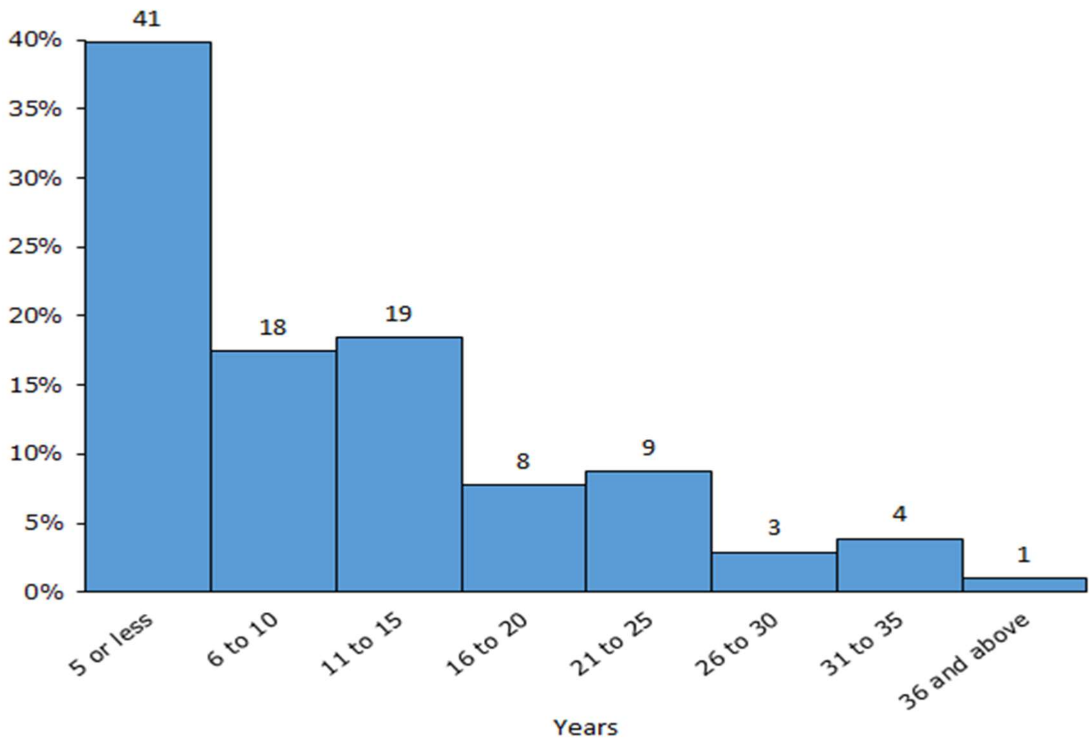


Figure 6.10 Major Activity Years histogram of sub-sample

Table 6.13 below summarises the statistics that concern the tenure in present occupation of the sub-sample.

Table 6.13 Major activity years of the sub-sample

Mean	10.93
CI for mean	(9.15 - 12.71)
Median	8.00
Std. Deviation	9.10
Std. Error	0.89
IQR	11
Minimum	.00
Maximum	42.00
N	103

Tables 6.14 and 6.15 illustrate the self-reported history of hand and wrist/forearm eczema. In 116 wet workers who declared having hand eczema, 27% (31) had symptoms at the time of the survey whereas in the group of wet workers (82) who declared wrist/forearm eczema 17% (14) had symptoms at the time of the survey. In both the groups, for the majority of wet workers who experienced eczema symptoms either on hands or wrist/forearm it happened less than a year ago from the time of the survey (63% in Table 6.14, and 55% in Table 6.15).

Table 6.14 Self-reported history of Hand Eczema

Hand Eczema		n
When did you last have eczema in your hands?	I have it just now	31 (27%)
	not just now but within the past 3 months	17 (15%)
	between 3-12 months ago	25 (21%)
	more than 12 months ago	43 (37%)
	Total N	116 (100%)

Table 6.15 Self-reported history of Wrist/Forearm Eczema

Wrist/Forearm Eczema		n
When did you last have eczema on your wrists or forearms?	I have it just now	14 (17%)
	not just now but within the past 3 months	15 (18%)
	between 3-12 months ago	16 (20%)
	more than 12 months ago	37 (45%)
	Total N	82 (100%)

The NOSQ-2002/SHORT questionnaire included question sets which concerned exacerbating factors for the self-reported eczema on hands and/or wrists/forearms of the participants. The participants were asked to name and specify whether contact with certain chemicals or anything else in or outside work makes eczema (on hands and/or wrists/forearms) worse. Moreover, they were asked whether they noticed any improvement of the eczema when they were away from the workplace. The section below presents the results of these eczema determinants.

Exacerbating Factors of Hand and Wrist/Forearm Eczema in work

-Hand eczema (n=109)

About 87% (95) of the participants declared that their hand eczema worsened after contact with certain chemicals in work, 8% (9) declared no worsening of hand eczema and 4% (5) did not know if contact with chemicals in work worsened their hand eczema. Out of the valid total (109), nine did not answer this question therefore, these cases were considered as missing and were excluded.

-Wrist/Forearm eczema (n=80)

A 59% (47) of the participants declared that their wrist/forearm eczema worsened after contact with certain chemicals in work, 31% (25) declared no worsening of the wrist/forearm eczema and 10% (8) did not know if contact with chemicals in work worsened their wrist/forearm eczema. Out of the valid total (80) of participants, 38 did not answer this question and therefore these cases were considered as missing and were excluded.

Table 6.16 illustrates the exacerbating factors at work as identified by wet workers with hand and wrist/forearm eczema. It is important to mention that the number of participants who answered this question is different from the valid total number discussed above due to the fact that not all participants chose to answer the question concerning the exacerbating factors. For the majority of participants (48 and 18) soaps and cleansers at work were amongst the most exacerbating factors for their hand and wrist/forearm eczema respectively. Other exacerbating factors were combinations of chemicals and type of work (wet work) or PPE and for some participants (3 for both hand and wrist/forearm eczema groups) the factors were unknown.

Table 6.16 Exacerbating factors of hand and wrist/forearm eczema at work

Exacerbating Factors At Work	Hand Eczema	Wrist/Forearm Eczema
	n	n
Soaps and Cleansers	48 (47.5%)	18 (37%)
Soaps and Cleansers and Personal Protective Equipment	9 (9%)	4 (8%)
Soaps and Cleansers and Wet Work	8 (8%)	5 (10%)
Chemicals and other materials	6 (6%)	3 (6%)
Wet Work	6 (6%)	3 (6%)
Unknown	3 (3%)	3 (6%)

Exacerbating Factors of Hand and Wrist/Forearm Eczema outside work

-Hand eczema (n=108)

A total of 53% (57) of the participants declared that their hand eczema worsened after contact with certain chemicals outside work, 39% (42) declared no worsening of the hand eczema and 8% (9) did not know if contact with chemicals outside work worsened their hand eczema. Out of the valid total (108) of participants, ten did not answer this question and therefore these cases were considered as missing and were excluded.

-Wrist/Forearm eczema (n=77)

A total of 48% (37) declared that their wrist/forearm eczema worsened after contact with certain chemicals outside work, 43% (33) declared no worsening of the wrist/forearm eczema and 9% (7) did not know if contact with chemicals outside work worsened their wrist/forearm eczema. Out of the valid total (77) of participants, 41 did not answer this question and therefore these cases were considered as missing and were excluded.

Table 6.17 illustrates the exacerbating factors outside work as identified by wet workers with hand and wrist/forearm eczema. It is important to mention that the number of participants who answered this question is different from the valid total number discussed above, due to the fact that not all participants chose to answer the question concerning the exacerbating factors. For the majority of participants (16 and 8) soaps and cleansers outside work were amongst the most exacerbating factors for their hand and wrist/forearm eczema respectively which is the same exacerbating factor for eczema at work.

Table 6.17 Exacerbating factors of hand and wrist/forearm eczema outside work

Exacerbating Factors Outside Work	Hand Eczema	Wrist/Forearm Eczema
	n	n
Soaps and Cleansers	16 (28%)	8 (21%)
Soaps and Cleansers and Fragrances and Cosmetics	6 (10%)	5 (13%)
Wet Work	4 (7%)	2 (5%)
Temperature	3 (5%)	2 (5%)
Unknown	3 (5%)	3 (5%)
Nickel		3 (5%)
Plants		2 (5%)

Improvement of hand and/or wrist/forearm eczema when away from work

-Hand Eczema (n=108)

A total of 6% (7) declared that their hand eczema did not improve when away from work, 23% (25) declared that sometimes there was improvement of hand eczema when away from work, 69% (74) declared that usually there was an improvement of the hand eczema when away from work and 2% (2) did not know whether their hand eczema improved when away from work. Out of the valid total (108) of participants, ten did not answer this question therefore, these cases were considered missing and were excluded.

-Wrist/Forearm Eczema (n=72)

A total of 14% (10) declared that their wrist/forearm eczema did not improve when away from work, 11% (8) declared that sometimes there was improvement of wrist/forearm eczema when away from work, 69% (50) declared that usually there was an improvement of the wrist/forearm eczema when away from work and 6% (4) did not know whether their wrist/forearm eczema improved when away from work. Table 6.18 below illustrates the frequencies described above. Out of the valid total (72) of participants, 46 did not answer this question therefore, these cases were considered as missing and were excluded.

Table 6.18 Improvement of eczema on hands and/or wrist/forearm when away from work

	Hand Eczema	Wrist/Forearm Eczema
No	7 (6%)	10 (14%)
Yes, sometimes	25 (23%)	8 (11%)
Yes, usually	74 (69%)	50 (69%)
Don't know	2 (2%)	4 (6%)
Total	108 (100%)	72 (100%)

Research Question (iii)

Is there an association between OIHD (on hands and/or wrist/forearm) and the development of atopic symptoms in the sample of wet workers referred to NHS Grampian OHS for various health issues (including skin)?

In order to address research question (iii) analysis using cross-tabulation between two of the NOSQ-2002/SHORT questions took place. The two questions investigated were the self-reported eczema on hands and/or wrist/forearm of the participants and the declaration of any atopic symptoms. The section below presents the results of the above.

-Association between OIHD on hands and the development of atopic symptoms (n=283)

In a valid sample of 283 participants (77%), strong association ($p<0.001$) between participants who had declared hand eczema and developing atopic symptoms was evident. Table 6.19 shows the self-reported presence/absence of hand eczema in relation to developing atopic symptoms. It is observed that wet workers who have had hand eczema, have significantly higher chances of developing atopic symptoms.

Table 6.19 Hand Eczema and Atopic Symptoms

	Have you ever had an itchy rash that has been coming and going for at least 6 months, and at some time it has affected skin creases?			
Have you ever had hand eczema?	**No**	**Yes**	**Don't know**	**Total**
No	143 (82.7%)	25 (14.5%)	5 (2.9%)	173
Yes	65 (59.1%)	42 (38.2%)	3 (2.7%)	110
Total	208 (73.5%)	67 (23.7%)	8 (2.8%)	283

-Association between OIHD on wrist/forearm and the development of atopic symptoms (n=281)

In a valid sample of 281 participants (76%), strong association (Chi-square p-value <0.001) between participants who have declared wrist/forearm eczema and developing atopic symptoms was evidenced. Table 6.20 shows the self-reported presence/absence of wrist/forearm eczema in relation to developing atopic symptoms. It is observed that wet workers who have had eczema on wrist/forearm, have significantly higher chances of developing atopic symptoms than those without eczema history.

Table 6.20 Wrist/Forearm Eczema and Atopic Symptoms

	Have you ever had an itchy rash that has been coming and going for at least 6 months, and at some time it has affected skin creases?			
Have you ever had eczema on your wrists or forearms (excluding fronts of elbows)?	**No**	**Yes**	**Don't know**	**Total**
No	175 (81.4%)	33 (15.3%)	7 (3.3%)	215
Yes	32 (48.5%)	33 (50%)	1 (1.5%)	66
Total	207 (73.5%)	66 (23.7%)	8 (2.8%)	281

6.4.2 Interviews

Research Question (i)

What are the experiences, attitudes and self-perceived needs of wet workers in NHS Grampian around how best to prevent OIHD?

Socio-Demographics

A total of 27 wet workers out of the 30 who initially agreed to take part in the interviews, were successfully interviewed for the purposes of Study III. The first two interviews were treated as pilot and they took place face to face. Once the interviews were completed the researcher sought verbal feedback from the participants regarding: the interview schedule, the clarity of the questions, the duration of the interview asked and any other feedback they had to offer. No subsequent changes were made as no points were raised by the two participants.

Thereafter, the researcher conducted 25 telephone interviews in a private office in Sir Ian Wood Building of Robert Gordon University in Aberdeen in December 2017. A few interviews had to be rescheduled due to participants' availability constraints and three participants did not engage after their interviews were rescheduled. The interviews were audio recorded and then transcribed verbatim.

The interview length ranged between 10 and 34 minutes, with a median of 17 minutes.

The interviewees consisted of a convenience sub-sample specifically selected on the basis of their availability as well as their potential contribution to theory (TDF), which provided theoretical representation (Ritchie et al. 2014). Despite the relatively small sample size, data saturation was achieved by applying the Francis et al. 10 + 3 criterion (Francis et al. 2010). A minimum of ten interviews was agreed to be analysed initially and then conduct three more interviews (stopping criterion) until no new ideas emerged (Francis et al. 2010). The criterion for saturation was achieved at interview 25.

The majority of the participants were females 92% (23) while male participants consisted of the minority of 8% (2). The median age was 44 years, with the youngest being 25 years and the oldest being 68 years. The mean number of years that the interviewees carried out wet work in the department they were working at the time Study III took place was nine years, whereas the mean number of years of wet work in total was 12. Amongst the interviewees there were 15 nurses (this includes various specialities, for example, community, neonatal, theatre/scrub, ward–based, auxiliary and healthcare support workers), one doctor, six wet workers from support services (domestics and maintenance), one allied health professional (radiotherapy) and two dental support (dental nurse and technician) interviewees. Table 6.21 provides demographic information of the interviewees regarding the years of wet work in the department they worked whilst the interviews took place as well as the total number of years they have performed wet work.

Table 6.21 Socio-Demographics of interviewees

Occupation	Years of Wet work in department	Years of Wet Work in total
Staff Nurse		
1	17	38
2	2	2
3	1	5
4	1	2
5	1	6
6	5	5
7	3	4
8	15	15
Dental Nurse		
1	9	9
Dental Technician		
1	34	34
Neonatal Nurse		
1	13	14
Community Nurse		
1	1	2
Heart Failure Specialist Nurse		
1	3	9
Trainee Health Visitor		
1	1	1
Nurse Auxiliary		
1	25	25
Domestic		
1	18	18
2	5	5
3	4	4
4	7	12
5	7	5
Healthcare Support Worker		
1	5	19
2	27	27

Doctor		
1	4	17
Radiotherapist		
1	11	11
Maintenance Engineer		
1	4	4

Interview Schedule

In the qualitative part of the Study III, a semi-structured interview schedule with qualitative and quantitative elements was developed by the researcher. As mentioned earlier, the interview schedule was structured around five main topics; i) Hand Hygiene, ii) Skin Care, iii) Skin Issues, iv) Use of health services or self-help approaches for any skin issues and v) Thoughts on skin health and skin care at the workplace. The results of these topics are presented below in order to set the background and provide the context of the wet-workers day-to-day practices of wet work and the development and/or management of skin issues both at the workplace and at home.

Section i) Hand Hygiene

In this section the interviewees were asked questions regarding their hand hygiene practices at work and at home.

Work

During a typical shift (including hospital and community patterns of either 12 or 8-hour shift respectively) the majority of the interviewees declared washing their hands up to 20 times (12) with nearly the same amount of interviewees (10) declaring hand washing frequency between 21 and 50 times per shift. Only a small number of interviewees (2 and 1) declared highly increased frequencies (between 51 and 100 times, and over 100 times) of hand washing during a typical 12-hour shift. The interviewees were asked to describe their hand hygiene technique as per the NHS Grampian protocol for hand washing (NIPCM 2019). Most of the interviewees (21) were able to describe the correct hand hygiene technique, with three interviewees following an incorrect technique and one stating that was not hand washing at all due to skin issues severity. Nearly a quarter of the interviewees (6) was also performing surgical scrubbing as part of their day-to-day job.

The surgical scrubbing frequency for these interviewees was up to 20 times per shift. Most of the interviewees who carried out surgical scrubbing (5) used a product called hibiscrub to scrub their hands, and one interviewee declared using betadine.

With regards to the frequency of using the alcohol-based hand rubs at work, the majority of the interviewees (11) declared using it up to 20 times during a typical shift, six between 21 and 50 times, one between 51 to 100 times and two interviewees said that they used the alcohol-based hand rubs over 100 times per typical shift.

The most typical glove type the interviewees declared wearing at work was the nitrile examination glove, a one use non-sterile rubber glove. There were nine interviewees who declared wearing both nitrile and sterile gloves as part of their job, one interviewee declared wearing industrial gloves and one interviewee declared using polycine gloves which are rubber gloves used in some labs for protection from certain chemicals.

The length of time wearing the gloves was as following; for nitrile gloves, 11 interviewees declared wearing the gloves up to 15 minutes at a time and 12 for over 15 minutes. For the length of wearing sterile gloves, two interviewees declared wearing them for up to 15 minutes and 6 for over 15 minutes based on the type of surgical case/procedure. Polycine and industrial gloves were worn up to 15 minutes every time as declared by one interviewee respectively.

Home

The interviewees were asked to describe their hand hygiene practices and routines at home on a daily basis. The majority of the interviewees (22) declared washing their hands at home with soap and water up to 20 times, whereas three declared washing their hands between 21 to 50 times at home. Three of the interviewees were new parents, however, none of them declared excessive (over 20 times a day) hand washing on a daily basis when at home. None of the participants declared using alcohol-based hand rub or any other type of rub at home.

When the interviewees were asked whether they wear gloves when they are doing cleaning tasks (washing the dishes, cleaning the bathroom with bleach or other industrial cleansers) at home, eight said 'yes', six said 'no' and 11 said 'sometimes'. The interviewees were also asked whether they had any hobbies that would bring them in contact with other chemicals or animals for example, gardening or crafting. If they declared so they were further asked whether they wore gloves during these hobbies. Out of the 25 interviewees, ten declared having a hobby that exposes them to other chemicals or animals. The hobbies included hairdressing, gardening, crafting (using glue), horse owning and swimming. The majority of interviewees (7) who declared having hobbies that bring them in contact with chemicals and or animals declared wearing gloves.

Section ii) Skin Care

In this section, the interviewees were asked questions regarding their skin care practices at work and at home.

<u>*Work*</u>

The majority or the interviewees (21) declared that they used hand cream products at the workplace, while four interviewees declared no use of hand creams at work. The frequency of hand cream application at the workplace varied amongst the interviewees as following: six interviewees declared to use hand cream on a typical shift once or twice, one interviewee declared using hand cream two to three times and five interviewees declared using hand cream three to four times.

The interviewees were also asked to provide details of the hand cream products they used to moisturise their hands at work. Various products were identified to being used by the interviewees as it is shown in table 6.22. These products included the NHS Grampian hand cream which is usually provided in wall dispensers in the hospital areas (usually allocated in the nurses' station), hand creams that can be purchased over the counter (Neutrogena, Dove, Nivea etc.) and prescribed hand creams (hemp, dermol500, epiderm).

Table 6.22 Use of hand cream at the workplace

Use of Hand Cream at Work		
Use of Hand Cream at Work	**Frequency of hand cream applications**	**Type/Brand of Cream**
Yes: **21**	Once or Twice per shift: **6**	NHS Grampian emollient: **3**
No: **4**	Two to three times: **1**	Avon: **1**
	Three to four times per shift: **5**	Doublebase and/or Dermol 500: **1**
	Five to ten times: **5**	Aveeno: **2**
	Ten to twenty times: **2**	Any over the counter: **3**
		Neutrogena: **3**
		Doublebase and/or Aveeno: 1
		Dermol500: **2**
		Hemp: **1**
		Dove and/or Vaseline: **1**
		Epiderm: **2**
		Nivea: **1**

Home

The interviewees were asked to describe their skin care practices and routines at home on a daily basis. The majority or the interviewees (21) declared that they used hand cream products at home, while four interviewees declared no use of hand creams at home. The frequency of hand cream application at home varied amongst the interviewees between a few applications to when and as required as illustrated on table 6.23.

The interviewees were also asked to provide details of the hand cream products they used to moisturise their hands when at home. A variety of products was declared to be used by the interviewees as shown in table 6.21. The products included creams that can be purchased over the counter without medical prescription such as Neutrogena, Avon, Dove, Vaseline and Nivea as well as prescribed hand creams such as doublebase, dermol500, epiderm. Table 6.23 also illustrates other products that the participants declared using to further contribute to their skin care at home. Most of these products appear to be corticosteroid-based products and/or antihistamines.

Table 6.23 Use of hand cream at home

Use of Hand Cream at Home			
Use of Hand Cream at Home	**Frequency of hand cream applications**	**Type of Cream**	**Use of Other Products**
Yes: **21**	When my hands get dry: **2**	Nivea: **3**	Yes: **8**
No: **4**	Once a day: **3**	Avon: **2**	No: **4**
	When I have an eczema flare up: **1**	Doublebase, Aveeno, Nivea: **1**	**What:** Epiderm from: **2** Hydrocortisone: **2** Mometasone furade (topical steroid): **1** Betnovate: **2** Diprobase: **4** Dermovate: **3** Alomazepine: **1** other steroid cream: **5** Antihistamines: **2** Protopic: **1** Micfinoid: **1** Prendisolone: **1** Healan steroid tape: **2** Fucibet: **1** Doublebase: **1**
	Twice a day: **5**	Aveeno: **4**	
	Three to four times a day: **3**	Any cream over the counter: **3**	
	Eight to ten times: **1**	Neutrogena: **3**	
	Ten to twenty times: **2**	Doublebase or Aveeno: **1**	
	Five times: **1**	Dermol500: **3**	
		50-50: **1**	
		Dove, Vaseline: **1**	
		Epiderm: **1**	

Section iii) Skin Issues

In this section the interviewees were asked questions regarding any skin issues they might have experienced at the workplace. The majority of the interviewees (24) declared experiencing skin issues at the workplace as shown in table 6.24a. The types of skin issues declared were dryness, redness, broken skin, bleeding, pain, inflammation, irritation and scaling. The majority of the interviewees (22) declared experiencing a combination of these symptoms. When the interviewees were asked why they think these skin issues occurred, ten declared it was due to the frequency of hand washing, ten due to the cold weather/seasonal effect, seven interviewees attributed the issues to the use of the alcohol-based hand rub, and one to two interviewees to other factors such as the type of hand towers used to dry their hands after hand washing, stress, scrubbing, glove type, soap used to hand wash, multiple consecutive shifts (usually more than two or three shifts in a row), allergies and pre-existing skin conditions. Once more the majority of interviewees declared that the skin issues occurred due to combinations of the above reasons.

Table 6.24a Skin issues at the workplace

Skin Issues at work	Type of skin issues	Why do you think they occur?	How do you handle them?	How soon they resolve?
Yes: **24**	Dryness: **14**	Frequency of hand washing: **10**	Increase the use of hand creams: **18**	They do not resolve, they improve: **2**
No: **1**	Redness: **13**	Alcohol-based hand rub: **7**	Use steroid cream: **6**	After a few days: **9**
	Open/Broken/Cracked Skin: **1**	Soap: **4**	See the GP: **1**	After a few weeks: **6**
	Itchiness: **10**	Gloves: **5**	Change of soap/other product: **2**	After a month: **2**
	Bleeding: **6**	Cold weather/Seasonal effect: **10**	Use of cotton gloves overnight: **1**	On-going: **3**
	Painful: **5**	Stress: **1**	Diet: **1**	
	Flaky: **1**	Scrubbing: **2**	Wet work avoidance: **5**	
	Inflamed: **4**	Consecutive shifts: **2**	Attend OHS: **1**	
	Irritation: **1**	Allergies: **2**	Other topical treatments: **2**	
	Scaly: **1**	Unsure:**1**	Combinations of ways for management: **16**	
	Dermatitis (unspecified): **2**	Use of hand towels: **1**		
	Combination of the above symptoms: **22**	Lack of moisturising: **1**		
		Direct contact with detergents: **1**		
		Underlying skin condition: **2**		
		Combination of the above reasons: **17**		

Table 6.24b Skin issues at the workplace

Do the skin issues reoccur?	Why?	Can it be prevented?	How?
On-going: **8**	Wet work: **20**	No: **4**	Increase the use of hand cream: **6**
Yes: **13** -every other month, -2-3 times a year, -during winter months	Cold weather/Seasonal effect: **6**	Probably: **5**	Change of products (gloves, soap, alcohol-based hand rub, hand towels): **7**
No: **4**	Underlying skin/health condition: **4**	Yes: **10**	Hand cream availability at work: **4**
	Unsure: **1**		Change of type of work (wet work): **4**
	Being a new parent: **1**		Appropriate use of Personal Protective Equipment: **4**
	Stress: **1**		Staffing levels: **2**
	Lack of moisturising: **1**		Work Environment (warmer): **1**
	Working in a High Risk (for example the Infection Unit): **1**		Early Intervention:**1**
	Products (gloves, soap, alcohol-based hand rub): **8**		More opportunities to moisturise the hands: **1**
	Inappropriate hand hygiene technique or direct contact with a chemical: **2**		Availability of OHS support: **1**
	Working multiple consecutive shifts (for example, five shifts in a row): **1**		
	Combination of reasons: **13**		

The majority of the interviewees (21) declared that once their skin issues developed, they would recur (skin exacerbations would either be on-going, monthly, yearly or occurring during the winter months) as shown in table 6.24b. The interviewees felt that the main reason the skin issues would recur was attributed to wet work (20). A nurse gave the following example to explain how avoidance of wet work allowed her/his skin issues to resolve:

'…if I have like a two week holiday my skin could be lovely then…' [P3].

Other factors that the interviewees attributed to skin issue recurrences are illustrated in table 6.24b with product suitability (including hand hygiene products and personal protective equipment) prevailing (8).

When the interviewees were asked if they believed the skin issues could be prevented, ten declared 'yes', four said 'no', five stated 'probably' and six did not answer the question. Increased use of moisturising hand creams (7) and change of products (5) were amongst the most predominant means of preventing skin issues reoccurrences. As shown in table 6.24b hand cream availability at work, changing the type of work, appropriate use of personal protective equipment, warmer environment as well as staffing levels, workload, more opportunities to moisturise the hands and availability of OHS support were recommended as other ways of addressing skin issues reoccurrences. A theatre nurse provided an example of two factors that were interlinked:

'…more staff in theatres would help, which means I wouldn't scrub as often which would help the skin on my hands…having more opportunities to moisturise my hands at work, let it sink in *(meaning the hand cream)* ***rather than having to constantly rewash and putting gloves on…'*** [P14]

Early intervention was cited by one of the allied health professionals as a factor to prevent skin issue reoccurrences:

'…a lot of people *(meaning wet workers)* ***are getting the products*** *(refers to alternative products and moisturisers)* ***to help them rather than leaving it till it gets to become a problem before sorting it out so early intervention definitely…'*** [P19]

Section iv) Use of health services or self-help approaches for any skin issues

In this section the interviewees were asked whether they had received advice and/or support within or outside work from any healthcare personnel (GP, dermatology, line manager and/or OHS) with regards to their skin issues. The majority of the interviewees (20) declared that they sought or received advice and/or support for their skin issues and five interviewees declared 'no' to this question. Two interviewees who declared not receiving any support or advice about their skin issues reflected on their statements,

'… I have mentioned it like 'look at my hands they are so sore' to my line manager but nothing. I think there is a gap *(from a management support point of view)* ***yes, I think probably because it is so widely accepted within the profession. It is kind of part of you know … a lot of nurses have really sore hands because you are constantly washing them and I think it is widely accepted as being the norm*** *(meaning to have sore hands)****…***' [P17]

'…I have managed myself … it's just so busy at work so no I don't think I can find time to go. No I just try to manage myself…' [P18]

Table 6.25 illustrates how many interviewees accessed each healthcare personnel as well as the interviewees (14) who sought advice from more than one healthcare personnel for their skin issues.

Table 6.25 Types of health personnel accessed

Health Personnel	N
Line Manager	7
OHS	14
GP	15
Dermatology	6
Combination of services	14

Table 6.26 describes a summary of the type of advice/support the interviewees received from each of the healthcare personnel. The interviewees expressed consistency across each healthcare personnel regarding the advice/support type they received.

Table 6.26 Type of advice/support from healthcare personnel

Health Personnel	Advice/Support
Line manager	-Products (ordering alternative products to use at work) -Referral to OHS -Support at work -Skin Surveillance -No support
OHS	-General advice on hand hygiene and skin care -Products (recommending alternative products to use at work) -Advice to go to the GP -Intervention at work (hand hygiene product specific)
GP	-Prescription/Treatment -Monitoring of skin issues -Advice regarding skin issues -Diagnosis -Referral to the specialist -Sick line
Dermatology	-Targeted treatment -Diagnostic tests -Diagnosis

Line manager

Two different points of view where expressed by a staff nurse and a HCSW regarding the support from management with regards to skin issues,

'…very supportive, they have been happy to comply with everything that occupational health has implemented for me….' [P14] Staff nurse

'…No, my work wasn't really that bothered…' [P25] HCSW

OHS

The interviewees who received advice/support from OHS expressed similar opinions regarding OHS advice on hand hygiene and skin care, as well as specific advice on product use at work and relevant interventions to assist with skin issue management,

'…Advised of what products not to use and reminded to use my creams…' [P3] Dental nurse

'…There was initial concerns about me taking in my own soaps because it did not have a pharmacy label on and I don't like my details being out for all my

patients to see. So I took all the pharmacy labels off and I think it was infection control who wasn't really happy about that. So occupational health have been really good for allowing me to take my own products and rather trying to enforce their products on me. They kind of said *(meaning OHS)* ***'What works for you' they did not want to change if you have got yourself in a stable situation and I think at that time my hands were quite bad they said 'look is there any possibility you can only do paperwork' so I did for a month so that my hands heal. It did not heal. I had to wash my hands at home when you go eating or go to the toilet and stuff so it's not making any difference...'*** [P19] AHP

GP

Out of the 15 interviewees who declared to have been seen by their GPs for their skin issues, six informed that they received prescription of products (such as moisturising creams, soaps and topical steroids) and two wet workers (see below) expressed their thoughts on the speed the GPs escalated their cases to the specialist doctor (dermatologist),

'...urgent referral to Dermatology...and he *(means the GP)* ***signed me off work till they knew what it was and I spoke to my line manager and they were supposed to be contacting occupational health...'*** [P25] HCSW

'...I went in with an emergency to my GP and they referred me to dermatology on the same day...' [P14] Staff nurse

Dermatology

All the interviewees who had been seen by a specialist doctor voiced similar opinions about the advice/support they received, which was about having diagnostic tests carried out, receiving diagnosis and appropriate treatment for their skin issues. Two wet workers also shared their thoughts on how they perceived the care they received from dermatology as follows:

'...they prescribed me new creams, they had a look at my skin and I feel that they are taking their time for me *(meaning that they dedicated time into investigating the case)****...'*** [P21] Staff nurse

'...Blood tests and prescription of creams... They've been really really good... My consultant has been very good and said if I had any problems, I can just email her...' [P19] AHP

The interviewees were asked whether they had accessed any other health services with regards to their skin issues. The majority of the interviewees (14) said 'no', seven interviewees said 'yes' and for four interviewees this question was not applicable. From the interviewees who declared to have consulted other health services most of them named the same healthcare personnel they had already accessed (GP, Dermatologist, OHS). An interviewee declared doing the hand hygiene online training (which is an annual mandatory online training for NHS Grampian wet workers called E-ksf) who further reflected as follows:

'...Considering I have been working for 40 years there *(meaning the hospital)* ***I know things anyway...'*** [P10] Domestic

Skin health surveillance at work was mentioned by two wet workers as a supportive mechanism at work. In particular, they said:

'...Wet worker's assessment *(meaning Skin Health Surveillance at work)****...So something that they brought out now, it's like mandatory for people that they are washing their hands a lot during day so they have a look at your skin. They ask you, it's just like a nurse or a healthcare support worker that have been trained they go on a training day and then they look at your skin and they basically just ask you if you have any health problems, or if you've seen your GP, so like with your hands, like if you have any skin issues, if you've seen your GP and then if you've got any redness, swelling, blotches. So it's just a form that they've got to say that ... if... [I don't know who it is who comes to see them I think it is the health and safety executive] that they got evidence that they are aware that their workers have got skin conditions...'***

Interviewer:*'...And do they take any actions if you have any problems?...'*

*Participant:****'...I have had no action in my time when I was in theatre...'***

'...I think it was an absolute waste of time...' [P21] Staff nurse

'...Hand Hygiene training/course in the hospital - participant is referring to skin health surveillance...they seen my hands I said I was seen by the doctor and they said you need to be referred to occupational health as well...' [P9] Maintenance Engineer

The interviewees were asked next if they had used/accessed any self-help material to assist with their skin issues. The majority of the interviewees (14) declared 'no', ten interviewees said 'yes' and for one interviewee this question was not applicable. Accessing self-help material was deemed unnecessary by one of the interviewees,

'...OHS gave me most of the information so I did not really need to get any from anywhere else...' [P2] Domestic assistant

The self-help material identified by the interviewees were online resources, support groups and the annual mandatory online hand hygiene training available to all wet workers in NHS Grampian (E-ksf). Online resources were perceived by the interviewees as 'vague', or 'general' and some declared that there is 'a lot' of information available, however, one domestic found online resources somehow helpful,

'...I searched up google, there is lots of information out there - Some advice I have adopted...' [P4]

With regards to E-ksf, two interviewees voiced their concerns as following:

'...E-ksf...erm.. *(participant pauses to think)* ***I would say it is very basic. I mean I don't think it goes into too much detail if you've got skin condition anyway. If that makes sense...'*** [P5] Community nurse

'...E-ksf...No I don't think it really provides you with any advice – it tells you how to wash your hands. And I do follow it because my hands do hurt...' [P17] HCSW

The last question in section iv) concerned the interviewees' beliefs regarding what would best help their skin issues resolve/retreat. Analysis of the data collected for this section identified ten dimensions which emerged from the key elements as reported by the interviewees. Due to the simple and single-dimensions that emerged, it was not required to develop typologies, therefore, the next stage of the categorisation process involved the development of categories and classes (Ritchie et al. 2014). Table 6.27 presents both the elements and dimensions.

Table 6.27 Interviewees beliefs regarding what would best help their skin issues resolve/retreat

Elements	Dimensions
Accepted how hands are [P1] Health visitor **Learn to live with it (meaning the condition on hands)** [P2] Domestic assistant **Accepted it as part of the condition** [P7] Staff Nurse **Always lived with it, do not know what it is like not to have it (referring to the condition on hands)** [P19] AHP	**Acceptance**
Believe that nothing can be done [P1] Health visitor **Believe it will never go away** [P2] Domestic assistant **Believe nothing can be done once the condition is manifested** [P7] Staff Nurse **Believe there isn't anything to be done** [P13] HCSW	**Denial/Nothing can be done**
Frequent moisturising of hands [P3] Dental nurse	**Frequency of moisturising**
Taking better care of skin [P5] Community nurse	**Looking after my skin**
Have the choice to bring own soaps in smaller containers [P5] Community nurse **Availability of hand cream at work and opportunity to use it** [P8] Staff nurse **Easy access of creams at work and to the staff** [P17] HCSW **Different product for hand washing** [P22] Dental technician	**Products' access/availability/appropriateness/quality/choice/resources**

A good quality moisturiser [P24] Staff nurse	
More support from OHS and infection control on an educational level, better education to GPs regarding work-related skin diseases [P12] Staff nurse **Educate the managers and staff, better education to OHS so they offer tailored advice to the wet workers affected** [P21] Staff Nurse	**Education/Training for workers, managers, OHS**
Work is causing the problem [P9] Maintenance engineer **Workload and type of hand washes** [P12] Staff nurse	**Wet work**
Support from management [P7] Staff nurse **Received appropriate support from the health professionals** [P14] Staff nurse **Managers are not aware of what clinical work involves** [P12] Staff nurse	**Support at work**
Increased hand washing during maternity leave [P1] Health visitor	**Being a New Parent/Maternity**
Warm environment at work, dehydration (not able to drink more than 2 or 3 glasses of water in a 12-hour shift, no easy access to water in the building) [P8] Staff nurse **Cold weather, winter months affect the skin** [P10] Domestic	**Environmental factors (Weather/Temperature in the workplace/Hydration)**

Diversity of opinions was observed in the dimensions referring to 'acceptance' and 'support at work'. For example, some interviewees described how they have learnt to live with their skin issues and accepted it, whereas some others admitted not knowing any different (how it would be living without having skin issues). With regards to support at work, some participants expressed that the lack of support was detrimental to their health and well-being at work (mainly referring to management), whereas others declared they received good support at work. Diversity of opinions was also observed in the environmental dimension where the interviewees identified a plethora of factors that could improve their skin issues: temperature at work, dehydration when working 12-hour shifts, access to water and the impact of the seasonal effect. The participants highlighted the importance of targeted education to improve their skin issues at work. They described that education for wet workers, managers as well as for services such as OHS, infection control and GP practices could offer a solution to their skin problems. The advice and information regarding skin health and care given to the participants by the health personnel mentioned above, was perceived as generic, or patronising, or sometimes irrelevant to their profession. Some participants perceived managers to be disconnected from clinical work and the tasks involved (referring to frequency of hand washing and type of hand washing e.g. surgical, hygienic etc.). Such matter was perceived by the participants as of high importance, since they believed it was directly related to the skin issues improvement at work. Participants also stated that managers should receive training specific to work-related skin diseases.

Section v)

*S*ection (v) of the interview schedule explored the interviewees' thoughts regarding skin health and care at the workplace. In order to analyse the data collected in this section, the researcher first categorised the transcribed responses in Microsoft EXCEL. The responses were combined into 45 dimensions which were then grouped into 17 categories that distinguished between different manifestations of the interviewees' responses. Table 6.28 illustrates this process and offers an overview of the range and diversity of the dimensions created for each of the questions asked in section (v). A higher-order classification was subsequently constructed to yield a set of three classes which are as following:

a) Skin Health and Care Facilitators,

b) Skin Health and Care Inhibitors and

c) Physical and Mental Effects of Skin Issues

Each of the three classes will be interpreted in the section that follows.

Table 6.28 Skin health and care at work

Skin Health and Care at work	Dimensions	Categories	Class
Is Skin Health/Skin Care at the workplace important to you	1. Infection	i. Risk of Infection (1, 12)	a. Skin Health and Care Facilitators (iv, vii, viii, ix, xii, xiii, xiv, xvi)
	2. Skin Image/Looking nice/Embarrassing	ii. Visual Aspect (2, 6, 13)	b. Skin Health and Care Inhibitors (v, vi, xv, xvii)
	3. Painful/Uncomfortable	iii. Sensory Aspect (3, 14)	c. Physical and Mental Effects of Skin Issues (i, ii, iii, x, xi)
	4. Working efficiently	iv. Quality of Work (patient care/organisation) (4, 5, 16, 21, 25)	
	5. Type of Work/Patient Care	v. Type of Work a. (tasks/environment) (31, 41)	
	6. Patients' Perception	vi. Type of Work b. (wet work/hand hygiene technique) (28)	
	7. Self-care	vii. Team Work (42)	
	8. Wet workers' Awareness	viii. Skin Care Self-Awareness (7, 8, 15, 22, 33, 43)	
	9. Difficult Management of Skin Issues	ix. Products/PPE (11, 26, 36)	
	10. Quality of life outside work	x. Skin Issues Management (9, 17, 32)	
	11. Product/PPE suitability	xi. Quality of life outside work (10, 20)	
Do you see any benefits from looking after your skin at work?	12. Infection	xii. Skin Issue Prevention (18, 19)	
	13. Skin Image/Looking nice	xiii. Adequate Time for skin care (24, 35)	
	14. Not Painful/Comfortable	xiv. Supportive mechanisms for skin care at work (37, 39, 40, 42, 45)	

	15. Self-Care/My own health	xv. Barriers for skin care at work (30, 38, 44)	
	16. Type of Work/Patient Care	xvi. No barriers for skin care (23, 34)	
	17. Skin Healing	xvii. Lack of supportive mechanisms/interventions for skin care (27, 29)	
	18. Skin Protection/Maintain Integrity		
	19. Prevention of skin issues		
	20. Quality of life outside work		
	21. Impact on the organisation		
	22. Self-Awareness of moisturising		
What would prevent you from looking after your skin at work?	23. Nothing		
	24. Time		
	25. Workload/Type of work & patient care		
	26. Product allocation/availability/suitability		
	27. Lack of support at work		
	28. Wet Work		
	29. Lack of Information/Knowledge/Training		
	30. Staff shortages		
	31. Work environment/Area of work		
	32. Being a new parent		
	33. Awareness		
What would help you improve your skin care at work?	34. Nothing		
	35. Time		
	36. Product access/availability/appropriateness/quality/choice/resources		
	37. Skin Surveillance at work		
	38. Staff levels		

	39. More support from management		
	40. Education/Information for staff and managers		
	41. Type of work		
	42. Team work (shared duties that will relief imbalanced workload and therefore, the frequency of hand washing)		
	43. Self-awareness for skin care		
	44. Understanding from patients (organizational behaviour)		
	45. Access to OHS		

All the interviewees (25) unanimously declared that skin health and care at the workplace was important to them. Further analysis grouped the 45 dimensions into 17 categories which captured the relevant dimensions of the phenomenon they described. The 17 categories were then grouped into three higher classes: a) skin health and care facilitators, b) skin health and care inhibitors and c) physical and mental effects of skin issues for the interviewees.

Skin Health and Care Facilitators

The researcher plotted patterns of linkage between eight categories which were developed based on the underlying dimensions identified. Although the eight categories represented different manifestations of the data, they all captured the same phenomenon: the participants' perspectives on what can be a facilitator for skin health and care at the workplace. The interviewees described the following as clear and positive influences for skin health and care at the workplace: quality of work, team work, skin care self-awareness, the products and PPE they used, prevention of skin issues, adequate time to perform skin care whilst at work, supportive mechanisms at work, addressing the existing barriers for skin care and declaration of no barriers. The feature of the workplace's significance in facilitating skin health and care was shared across the sample. The interviewees associated team work, workload, work efficiency, type of clinical work, product availability/suitability and provision of patient care with successful skin health and care practices. Another feature that was linked with skin health and care facilitators was its prevention. Interviewees declared that having time to look after their skin at work was a key feature as well as targeted education for managers and supportive services such as OHS.

Skin Health and Care Inhibitors

Similarly, the researcher detected patterns through associations and linkages between four categories based on multiple identified dimensions. The patterns that emerged between inhibitors and skin health and care at work were this time linked to a variety of features. For example, the interviewees linked skin health and care inhibitors to their experiences of staff shortages, lack of support at work (including lack of understanding from the patients), type of work (referring to wet work and in particular increased frequency of hand washing) as well as work environment and lack of information/training/knowledge. There were two skin health and care inhibitor features (staff shortages and type of work) which had the same dimension attached to them, namely time. It is important to acknowledge that the time dimension has been identified by the interviewees both as a facilitator (making time to look after your skin at work) and as an inhibitor (lack of time to perform skin care) for skin health and care at the workplace.

Physical and Mental Effects of Skin Issues

With regards to the physical and mental effects of skin issues, linkage between the categories and dimensions encompassed a variety of features. The interviewees described the physical effects of skin issues at work as being painful, uncomfortable, difficult to manage, taking prolonged time to heal as well as increasing the risk of infection to themselves and the patients. The mental effects of skin issues were also linked to a variety of experiences the participants declared: embarrassment, awareness of how patients will perceive them (fit or not fit to be looking after patients), not looking professional (for themselves, their colleagues and patients), awareness of distorted skin/self-image and wanting their skin to feel and look nice. Additionally, quality of life outside work, including parenting and ability to engage in hobbies, were considered of high importance for the interviewees.

Table 6.29 displays in detail the diversity of responses within each of the three main classes within the categories attached to them. Direct quotations from the interviewees are shown in the table in order to provide evidence of how different phenomena and views are attached to each of the particular categories.

Table 6.29 Classes of Skin Health and Care at Work

Skin Health & Care at Work Classes		
Facilitators	**Inhibitors**	**Physical & Mental Effects of Skin Issues**
Quality of Work (patient care/organisation) *'…Working more efficiently…'* [P3] Dental Nurse *'…Affects patient care (meaning if there are skin issues) …' '…Prevents breaking out and sickness absence…'* [P13] Nurse Auxiliary *'…Looking after my skin at works it means that I am able to do my job to the best of my ability and I don't feel I am a hindrance to anything...' '...Very important to me if my skin breaks down I am not able to do my job as effectively…'* [P14] Staff Nurse *'…Service factor (referring to offering care for the patients). Broken skin costs the health service a lot of money…' '…Time constraints or emergencies…'* [P17] HCSW *'...it portrays a bit of professionalism as well. I want to look after myself so that I can work better...'* [P19] AHP *'…Type of work…'* [P21] Staff Nurse *'...Being a scrub nurse we need to have hands that aren't damaged. Very important at my work…' '…Type of work (cannot moisturise before scrubbing)…'* [P24] Staff Nurse	**Type of Work a. tasks/environment** *'…direct skin contact with water or oil. I work in maintenance side. Sometimes I have to put my hand in to see where the leak is ken?...'* [P9] Maintenance Engineer *'…Patients' housing conditions (not very clean)…'* [P16] Heart Failure Specialist Nurse *'…Area of work in the hospital (some areas allow you using your own products where another areas don't…'* [P21] Staff Nurse *'…Patient and housing conditions…'* [P25] HCSW	**Risk of Infection** *'…Infection risk…'* [P1] Health Visitor, [P2] Domestic Assistant, [P3] Dental Nurse, [P4] Domestic, [P23] Staff Nurse, [P25] HCSW *'…Infection risk to patients. Self-risk of infection…'* [P8] Staff Nurse, '…for cross infection…' [P22] Dental Technician *'...for my protection and everyone else's protection...'* [P9] Maintenance Engineer *'…Infection risk to my patients…vulnerable babies...'* [P11] Neonatal Nurse *'Infection risk towards patients. I put them before me...I would never ever put myself before that baby...'* [P12] Staff Nurse

Team Work *'...if the junior doctors played their part as well and they weren't leaving everything for me...'* [P17] HCSW	**Type of Work b. wet work/ hand hygiene technique** *'…the inability of using the alcohol gel which means increased hand washing. It is really kind of difficult ... it is difficult to maintain good skin when you are always washing them (meaning the hands)...'* [P7] Staff Nurse *'…your hands are always in water and you have to wash them and dry them...'* [P10] Domestic *'...your hands are not quiet dry when you put the gloves on and then that takes the skin off your hands when you take the gloves off and things like that when you are hurrying…'* [P17] HCSW *'…Frequency of hand washing…'* [P21] Staff Nurse	**Visual Aspect** *'…it used to be very embarrassing treating patients in the wards when your hands are bleeding...I could see patients looking very alarmed…'* [P1] Health Visitor *'…Important on how they look and feel (meaning hands)…'* [P8] Staff Nurse *'...You have to look after your skin because it does not look good...'* [P9] Maintenance Engineer *'…Looking nicer…'* [P3] Dental Nurse
Skin Care Self-Awareness *'...I've seen how bad it can deteriorate from not looking after it...it should be important for other people as well...they should be aware...'* [P5] Community Nurse *'…keep the skin in good condition…'* [P7] Staff Nurse *'...you only get one set of skin...the first thing of contact is your hands...'* [P9] Maintenance Engineer *'…Remembering to put hand cream during break times…'* [P11] Neonatal Nurse *'..if my skin is doing well I am doing well...'* [P14] Staff Nurse	**Barriers for skin care at work** *'...sometimes I have to scrub more than I would like (due to staff shortages)...'* [P14] Staff Nurse *'...staff shortages...'* [P13] Nurse Auxiliary, [P24] Staff Nurse *'...you know they (referring to patients) can be quiet demanding as in now now now you know and to keep a happy atmosphere you know you do things now now now which really.... it is the organisational behaviour absolutely...'* [P17] HCSW *'…Time Factor…'* [P5] Community Nurse, [P7] Staff Nurse, [P8] Staff Nurse, [P11] Neonatal Nurse, [P12] Staff Nurse, [P17] HCSW, [P18]	**Sensory Aspect** *'…I don't like having cracked hands ... When hands are rough they catch...'* [P8] Staff Nurse *'…Yes I would feel better and not sore...There is nothing worse than standing in the shower crying because your skin is so sore...'* [P19] AHL *'…It is very painful when you have an exacerbation...'* [P12] Staff Nurse

'…Moisturising skin after hand washing. It is me paying more attention and just make sure that I am doing it...' [P16] Heart Failure Nurse Specialist *'...Having the consciousness and thinking about the skin...and moisturising…'* *'…Awareness - thinking about skin importance…'* [P18] Paediatric Consultant *'…From the minute now that I see anybody that has skin that looks like mine when it started I advise them all to got to occupational health or their GP…'* [P21] Staff Nurse *'…Better management from own perspective. Being proactive…'* [P23] Staff Nurse	Paediatric Consultant, [P19] AHP, [P21] Staff Nurse, [P24] Staff Nurse	
Products/PPE *'...I was given products by OHS but then I found it quite difficult to get my manager to order the products...'* [P1] Health Visitor *'…we have no control over what products are being purchased (means in the organisation and referring to the product selection process…'* [P3] Dental Nurse *'…More moisturisers, gentler soap, more access to hand cream…'* [P8] Staff Nurse	**Lack of supportive mechanisms/interventions for skin care** *'...Lack of information regarding product availability, for example, a smaller bottle of moisturiser that would be practical...'* [P8] Staff Nurse *'…Occupational Health access - self referral rather than going to the GP…'* [P17] HCSW *'...No information out there and being realistic without going straight to occupational health ...wouldn't really know other than looking on the internet where to find information...'* [P20] Staff Nurse	**Skin Issue management** *'...I've seen how bad it can deteriorate from not looking after it...'* [P5] Community Nurse *'...management of skin break out is difficult and lengthy in time...'* [P11] Neonatal Nurse *'...I would never phone in sick because my hands are sore...it is only two of us on a shift with 10 intensive care babies so if I am not there it doesn't run...'* [P12] Staff Nurse

'…Appropriate use of gloves for every task…' [P9] Maintenance Engineer *'…Better quality of hand towels…'* [P13] Nurse Auxiliary *'...I have observed that a lot of people have dermol500 for specifically washing their hands and I have noticed that a lot of people will use it ... although it is not for them...you know I do think if it was there people would use it...'* [P17] HCSW *'…Availability of hand lotion in the wards…'* [P18] Paediatric Consultant *'…Smaller containers of soap for example that you can attach onto your uniform and have the products always with you…'* *'…Product allocation/availability in different work stations…'* [P19] AHP *'…Product availability and suitability…'* [P21] Staff Nurse *'…Not enough hand lotion dispensers…'* [P22] Dental Technician		

'...Product limitation working in the community The products I use may affect the patients, there are so many people with allergies now...' [P25] HCSW		
Skin Issue Prevention *'...Keep the skin in good condition...'* [P7] Staff Nurse *'...you notice when it hasn't been done I notice when they are cracking and bleeding, so I notice the other way round...'* [P8] Staff Nurse *'...Moisturising protects the skin. Prevents breaking out and sickness absence...'* [P13] Nurse Auxiliary *'...Helps keep your skin moisturised. Helps your skin toughen up and helps not being so sensitive...'* [P25] HCSW		**Quality of Life Outside Work** *'...Outside of work I like to look nice, I don't like to feel like my skin is holding me back from anything. If my skin is doing well I am doing well...'* [P14] Staff Nurse *'...I play the guitar '...sometimes it is sore to play the guitar when your hands are like that...'* [P22] Dental Technician
Adequate Time for Skin Care *'...Time to take care of my skin and apply the creams...'* [P1] Health Visitor '...Time Factor...' [P11] Neonatal Nurse *'...More keeping break times to give your skin a break. More frequent breaks...'* [P12] Staff Nurse		
Supportive mechanisms for skin care at work *'...Skin surveillance at work and more information/education in the staff room like information leaflets...'* [P4] Domestic		

'...to say to your line manager about your skin and your hands...' [P10] Domestic *'...Definitely more information for staff members at pre-placement screening and/ via email reminders through the Global emails '...more information out there and to be made aware of where to find the information...'* [P20] Staff Nurse *'...Better education for managers/management to allow better understanding of the importance of the skin issues. I just found people very dismissive of the fact that you have got a skin condition because they think it is not important, although the skin is the largest organ in the body. More support from the organisation. I don't think that they know how difficult skin condition is. Education for the managers. I think just education is the way forward for sure. More support from the organisation. I don't think that they know how difficult skin condition is...'* [P21] Staff Nurse *'...People listening to our needs, I guess people listening to us and saying ... there is no money for it...'* [P25] HCSW		
No barriers for skin care *'...Nothing. I do everything I can...'* [P2] Domestic Assistant *'...Nothing...'* [P15] Domestic Supervisor		

6.5 Discussion

This section provides an overview of the main findings in relation to aim and the research questions corresponding to both the approaches of Study III. The limitations, strengths and weaknesses of Study III as well as the interpretation of the findings in relation to published literature are also discussed in this section. Moreover, the discussion will consider how the findings of Study III inform the need for the development of an evidence-based intervention for the prevention of OIHD.

6.5.1 Quantitative approach

The use of the NOSQ-2002/SHORT in NHS Grampian wet workers enabled the researcher to carry out a preliminary investigation of their socio-demographics (age, gender, years in present occupation and years of major activity at work), self-reported hand and wrist/forearm eczema, exacerbating factors of eczema in and outside work and the association between OIHD and the development of self-reported atopic symptoms.

Socio-demographics

Age and Gender

The age profiling of the wet workers who took part in Study III showed a distinctive division into two major age groups: (i) twenties to mid-forties and (ii) mid-forties to seventies. Earlier in chapter 4, following the review the OHS skin surveillance scheme during the period 2010-2015, it was reported that OIHD was prevalent amongst younger female wet workers (less than 35 years of age). The gender difference observed in Study I as well as Study III, with a female predominance, is attributed to the high proportion of females working in the organisation. Bregnhoj et al. (2012) also described female predominance in their study that investigated the prevalence of hand, wrist/forearm eczema amongst Danish hairdressing apprentices which is another female dominated profession. The most recent systematic review regarding interventions for preventing OIHD, by Bauer et al. (2018), reported that the role of endogenous attributes (age, gender, ethnic differences) as risk factors for the development of OIHD is yet unclear. It is, therefore, not possible to ascertain whether females within younger age groups are at higher risk of developing OIHD.

Other factors

Exogenous factors may have also contributed to the observed socio-demographic profile of the sample. The time of the year that Study III took place as well as sickness absence levels in the organisation during the same period could have contributed to the results. As mentioned earlier in this chapter the survey took place between 22nd August 2017 and 31st October 2017. August and September, in particular, are months that large numbers of NHS Grampian staff take annual leave, which is a matter the researcher anticipated when planning for the length of keeping the survey open. The annual leave factor was also taken into consideration for deciding what the best time to send reminders was (two-week intervals). According to ISDb (2019) the annual sickness rate for NHS Grampian in 2017 was 4.78 which appears to be slightly higher from 2016 where it was 4.62 (sickness absence rate is calculated by the hours lost divided by the total contracted hours and multiplied by 100). Further review of the published data tables for the annual sickness rates in NHS Grampian during the year 2017, showed that the months September and October had high rates of sickness absence (4.88 and 4.97 respectively) (ISDb 2019). It is also important to consider work environment factors when interpreting the results of this study. In particular, accessibility to office facilities and computers in the clinical areas is limited in NHS Grampian hospitals and clinical areas. In spite, the exogenous factors discussed above, the sample represented the NHS Grampian wet workers population accurately in regard to age, gender and occupational group.

Number of years of wet work in current occupation and in total

The mean number of years participants had been in their present occupation was 13 years, which was very similar to the mean number of years in their major activity (12 years). Major activity was described by the participants in various terms, e.g.: 'patient care', 'cleaning', 'nursing', 'clinical work', 'scrubbing', 'dental care', and 'housekeeping'. The occupational groups of the participants in the survey were similar to the groups identified in Study I (see chapter 4), i.e. commonly expected high-risk working areas for wet work: nursing and midwifery, AHP, support services, dental and healthcare sciences. This observation is suggestive of sample representation in both studies.

Distribution and determinants of OIHD on hands and wrist/forearm

The majority of the sample declared having eczema on hands and wrist/forearm. Participation in the survey was perhaps most relevant and of interest to wet workers who at some point had experienced/developed skin issues. Although the evidence is inconclusive, skin health and care amongst wet workers in the organisation should be considered a priority for everyone at risk, as it is a significant factor in preventing the development of OIHD.

As previously discussed, the NOSQ-2002/SHORT is a standardised tool designed to survey work-related skin disorders (Flyvholm et al. 2002). Shamout and Adisesh (2016) argued regarding the validity of this tool by comparing it to the gold standard of clinical examination in the study of Bregnhoj et al. (2012) which took place among Danish hairdressing apprentices. In this study, where 502 hairdressing apprentices were examined for eczema using the NOSQ-2002 SHORT, a sensitivity of 70.3%, specificity 99.8%, positive predictive value of 96.3% and negative predictive value of 98.5% were found, concluding that self-reporting is likely underestimating hand eczema prevalence in comparison to clinical examinations (Shamout and Adisesh 2016). This suggests that NOSQ-2002/SHORT can be used as self-reported diagnosis tool in large populations and estimate prevalence.

Wet workers who self-declared hand eczema were significantly more than those who reported eczema on wrist/forearm on all the relevant questions (self-reported history, exacerbating factors in and outside work, of hand and wrist/forearm eczema). Additionally, the total sample of wet workers who took part in the survey had been working, on average, 33 hours per week and no participant declared doing any other type of paid wet work outside their current occupation. The majority of wet workers (apart from one participant who declared being exposed to wet work for less than one year) were already exposed to wet work for a minimum of one year when the survey took place. With regards to self-reported history of hand and wrist/forearm eczema, the majority of wet workers, within both groups, who experienced eczema symptoms declared that it happened more than a year before the time of the survey. Such results could indicate successful management of eczema at the workplace; however, it is not possible to ascertain the reasons/contributory factors of success, whether such symptoms will recur, how often/after how long and what the triggers may be. These are important factors to be taken into consideration for future research. They could be determined by being incorporated into the design of preventative interventions (e.g. a one-year period between baseline and follow-up periods, use of validated tools for both self-reported and/or symptom-based diagnosis).

Similar exacerbating factors were declared in both the groups regarding the determinants of self-reported eczema on hands and wrist/forearm, both in and outside work. Soaps and cleansers appear to be amongst the most common exacerbating factors. The combination of soaps and cleansers with either PPE or wet work also accounted as a frequent exacerbating eczema factor in both groups. The same causal factors of OIHD are also prevalent in other wet work populations (hairdressers, food industry workers, metal workers, brick layers) along with continued contact to solvents, food ingredients and cutting oils/fluids (Bauer et al. 2018; Johansen Frosch and Lepoittevin 2011; Malten 1981).

The majority of wet workers in both groups declared that their eczema symptoms (on hand and wrist/forearm) usually resolved when they were away from work. This observation confirms that wet work, hand hygiene products as well as PPE are risk factors of the development and/or exacerbation of OIHD, in accord with Bauer's et al. (2018) systematic review.

Association between OIHD and the development of atopic symptoms

Strong association between OIHD and the development of atopic symptoms was evident in the sample of NHS Grampian wet workers who self-reported both hand and wrist/forearm eczema. Considering that the findings of Study III concern a small sample of the wet worker population in NHS Grampian, it is possible that OIHD could be affecting significantly more individuals than those who are part of the local OHS surveillance scheme and is, therefore, subject to underreporting. Although OIHD is not a life-threatening condition, it can, in some cases, become severe enough to interfere with the wet worker's quality of life in and outside work, cause long-term illness, inability to work as a wet worker and costs to the individual, the organisation as well as society (Bauer et al. 2018; Bauer et al. 2010). Even though there is not enough evidence to support that atopy increases the risk of developing allergic contact dermatitis, atopic individuals are more likely to develop asthma, contact urticaria and even anaphylaxis after contact with natural rubber latex (Palmer, Brown and Hobson 2013). Working in environments involving significant exposure to irritants should be approached with caution for those with atopic history. Prevention of OIHD is, therefore, of vital importance for the wet workers as well as the organisations.

6.5.2 Interviews

The use of semi-structured interviews in the sub-sample of NHS Grampian wet workers enabled the researcher to investigate more in depth the key areas raised from the NOSQ-2002/SHORT by exploring the experiences, attitudes and self-perceived needs of the wet workers around how to best prevent OIHD.

Socio-demographics

The age profiling of the interviewees was similar to the first age group (twenties to mid-forties) that emerged following the survey of Study III. The mean age of the interviewees was 43 years. The average number of years of tenure in present occupation was nine and the average number of years of total exposure to wet work was 12 (with maximum 38 years and minimum one year). A female predominance was observed in the sub-sample, which was also attributed to the female dominance in healthcare organisations as discussed earlier. The interviewees represented high-risk occupational groups (as identified previously in Study I) for wet work such as theatre, neonatal unit, support services, community and AHP. The sub-sample profiling, reflected accurately the socio-demographic characteristics of the NHS Grampian wet worker population (as reported in the NHS Grampian annual workforce reports). A representative sample reduces bias which in turn is useful when drawing conclusions.

Section i)

In section one the hand hygiene and skin care practices of the interviewees were explored. There were four wet workers who described the wrong hand washing technique. Although the number is small, the fact that some wet workers are not following appropriate and recommended techniques is a matter of concern. Inappropriate hand hygiene techniques can put both the wet worker and the patient at risk of hospital associated infection (WHO 2009). Furthermore, it can be damaging for the skin structure and flora of the wet worker which in essence can develop into OIHD and subsequently cause long term skin issues (Gould 2012). Training targeted at enhancing the wet workers' knowledge and awareness around the importance of correct hand hygiene and skin care practices at all times is, therefore, urgently required. This can be achieved by electronic or written reminders, face to face sessions (internal training/at ward level) as well as brief seminars delivered by trained individuals to wet workers.

The interviewees declared 50% less use of the alcohol-based hand rub compared to the frequency of hand washing with soap at work. The use of alcohol-based hand rub (when indicated and appropriate as hand disinfection) is kinder to intact skin when compared to the use of soap and water as it evaporates leaving the cells (lipids) of the epidermis intact (WHO 2009). It is unclear from the findings of this study why the application of alcohol-based hand rub remains low (this aspect was not further explored in the interviews); further investigation is required to ascertain the possible factors associated with this finding. In a UK survey of OSD amongst HCWs, it was found that non-clinical staff would use soap more times than alcohol-based hand rub in comparison to clinical staff (Campion 2015). It has been previously confirmed that nurses who associate OIHD with their clinical work often accuse the alcohol-based hand rub as a contributory factor (Gross-Schutte et al. 2011). Alcohol-based hand rubs tend to evaporate within seconds, leaving healthy skin intact. Changes in skin conditions from the use of alcohol-based hand rub are also proven to be less significant when compared to the damaging effects of water and soap (Loffler et al. 2007; Slotosch, Kampf and Loffler 2007). The frequency of the alcohol-based hand hub use requires further investigation, nevertheless, wet workers would benefit from being taught and reminded of the product's benefits regardless. Organisation-wide training and education via electronic means (e.g. annual hand hygiene training on E-ksf) could enhance knowledge and encourage increase of product use. Input and support from management may also contribute positively to achieving better uptake of alcohol-based hand rub uses.

Increased (up to 20 times a day) hand washing at home was declared by the interviewees. Cleaning tasks as well as contact with other chemicals (glue, plant allergens, alkalis, and solvents) was performed most of the times without wearing protective gloves. It is evident that the interviewees continue to expose themselves to risk factors which can cause breakdown of skin outside work without considering skin protection in the same way as they do at work. The need for helping the wet workers to develop knowledge and skills about skin health and care at home is evident and of vital importance. Chemicals contained in household cleaning products, glue/paint and gardening products are damaging to the skin. Moreover, non-occupational skin disorders can cause exacerbations of the underlying skin issues at the workplace (Palmer, Brown and Hobson 2013).

Section ii)

In this section the skin care practices at work and at home were explored. The majority of interviewees declared using hand creams at work as frequently as three to ten times in a typical 12-hour shift. Grosse-Schutte et al. (2011) investigated the practices and knowledge of skin care amongst nurses in medical and surgical wards and found that skin care at work was not sufficient; a 10% of HCWs would never use skin care product whereas 49% of the participants would apply hand cream once or twice during a working day (hours of a working day were not specified in the paper). Increased frequency of using hand moisturisers at work was reported by interviewees who either had pre-existing skin conditions or had developed severe exacerbations of symptoms at some point. This is supported by evidence found in a previous study where clinical staff with ongoing skin symptoms declared more frequent use of hand creams (Campion 2015). It is evident that further research is required to explore the knowledge and beliefs in relation to their skin care behaviours at the workplace.

The use of the NHS Grampian emollients available in dispensers, was very limited as it was declared to be used by only three interviewees. Such result possibly indicates that the availability and allocation of the hand cream provided in the organisation is limited. Most of the interviewees declared bringing their own products at work to moisturise. It is not possible to ascertain from the available evidence whether such practice increases the risk of infection to the staff and the patients, nor whether over the counter creams are appropriate for skin moisturising as they contain paraben, paraffin and silicon which can act as sensitisers. Finally, it is not possible to assess the over the counter creams cost to the individual. Optimising product access and allocation is an extremely important aspect that urgently needs to be brought to the attention of the organisation. Easier access to hand creams will allow more frequent application, therefore, better skin protection for the wet workers which can potentially prevent OIHD.

The majority of the interviewees also declared using hand creams at home; however, the frequency of hand cream application was significantly lower compared to the frequency of using hand creams at work despite declarations of increased hand washing at home. Such observation indicated that interviewees' beliefs regarding the importance of skin care outside work was different. Burke et al. (2018) found no association between hand moisturising practices at home or at work based on a sample of 50 nurses. Further investigation of this phenomenon is required in order to reinforce frequent skin care practices outside work. Also, some interviewees (8) declared the use of other products at home including prescribed emollients and corticosteroids which indicated that for those wet workers the skin issues were more severe, therefore, required more targeted regimes for their management and/or treatment.

Section iii)

In section (iii) the interviewees discussed the skin issues they experienced at the workplace. The majority of the interviewees (24 out of the total 25) declared having skin issues at work. The majority also declared having experienced a combination of symptoms including dryness, redness, itchiness, bleeding, pain, open/cracked/broken skin all of which are typical symptoms of OIHD (HSE 2004). Amongst the reasons of skin issues occurrence the interviewees declared wet work, product appropriateness (including hand towels for drying the hands after hand washing), seasonal effects, stress, consecutive shifts and combination of these reasons. These reasons have been previously reported by HCWs as the main responsible agents for their skin changes (Campion 2015). Most of the interviewees declared that they handled the symptoms by increasing the use of moisturisers. Increased use of hand cream application continues to constitute a mainstay in both treatment and prevention of OIHD (Burke et al. 2018; Ibler Jemec and Agner 2012). However, the interviewees' approach contradicted their practices at home as discussed in section (ii) above. A gap in the knowledge of the importance of consistent skin care at work and outside work is being identified and it is required to be further investigated so that it can be effectively bridged (Burke et al. 2018). Other ways to manage skin issues as declared by the interviewees was avoidance of wet work, change of hand hygiene products, use of corticosteroid creams and/or combinations of these ways. Only nine interviewees declared that their skin issues resolved after a few days. For the majority, the issues took weeks, months, recur frequently (every other month or two to three times a year) or remained long-term for the same reasons they initially appeared. The majority of the interviewees believed that the skin issues can be prevented either by increased use of hand creams, or change of products/type of work, or more appropriate PPE, staffing levels, early intervention, work environment, availability of OHS support and more opportunities/time to moisturise at work. These are significant factors to incorporate into the design of interventions aimed at preventing OIHD. Further, attention is required regarding the significance of skin care practices at home in order to ensure continuity in skin health and care of the individual.

Section iv)

In section (iv) the interviewees stated what type of health personnel or self-help approaches they used/accessed for their skin issues. The interviewees accessed a combination of services regarding their skin issues both at work (OHS and/or line manager) and outside work (GP and/or dermatology). The findings were indicative of skin issues severity that required escalation to medical personnel for diagnosis and targeted treatment. The majority of the interviewees showed awareness of what each of these services entailed with regards to the management of their skin issues either at work or outside work.

Diversity of opinion was observed amongst the interviewees regarding their thoughts for the advice and support they received. Some wet workers declared that they felt well supported by management and OHS regarding signposting, advice and provision of alternative products/adjustments whilst some others expressed opposite opinions regarding the support they received at work. Some participants declared that management of skin issues and escalation to appropriate services at work was subject to the line manager's awareness/knowledge. Gaps remain in relation to the risk of developing OIHD and the benefits health assurance programmes (e.g. workers' education, training and health surveillance at the workplace) can have in preventing or managing it successfully (Nicholson et al. 2010).

Online resources as well as online training within the organisation were perceived as non-robust means of self-help by the majority of the interviewees due to either their simplicity or plethora of information available on the internet. Specific education/training as well as expertise in skin issues from the relevant personnel at the workplace were the prominent recommendations of the interviewees. Grol (1992) and van der Meer (2014) argued that educational interventions targeted at improving knowledge and skills amongst HCWs have positive effects. Lack of knowledge regarding work-related skin disease amongst nurses, possibly affecting their behaviour towards skin care, has been previously reported (Grosse-Schutte et al. 2011). Further investigation is required to ascertain to what degree such inconsistencies exist and how they can be addressed in order to promote the skin health and prevention of work-related skin disease. Teaching and provision of better information to individuals may also decrease the prevalence of OIHD amongst nurses (Gross-Schutte et al. 2011).

Section (iv) also explored the interviewees' beliefs regarding what would best help their skin issues resolve and retreat. Following data coding and indexing, the responses of the interviewees were categorised into ten dimensions. The interviewees expressed strong opinions regarding the products' availability, allocation, quality and choice in relation to resolution of their skin issues at work. In the context of OIHD prevention within workplaces where exposure to potential irritants and wet work are unavoidable, products for skin cleaning, protection and care should be considered based on:

- type of working materials and/or skin condition
- time available to apply the product before or after the skin-damaging activity
- type of individuals who use the product (healthy or with existing skin issues)
- recommendations to promote health and education
- occupational/medical aspects of product acceptability and usability (Fartasch et al. 2012).

Similarly, strong arguments were voiced by the interviewees around the importance of management support at the workplace and appropriate education/training for workers and managers around skin health and care at work. It was apparent that the wet workers affected by work-related skin issues were aware of the impact wet work, environmental factors, or personal circumstances (e.g. being a new parent) could have on their lives in and outside work. It is known that individuals affected by OIHD can experience undesirable psycho-social effects such as sleep and leisure activities disturbance (Meding, Wrangsjo and Jarvholm 2005). The interviewees perceived that lack of supportive mechanisms and education (of both wet workers and managers) at work as the most prevailing factors for successful management of OIHD. In the past decade, systematic reviews have been focusing on prevention options for OIHD (Bauer et al. 2018; Smedley et al. 2011). Evidence also suggests that organisations should play a pivotal role in creating the opportunities for the prevention of work-related skin disease (van Gils et al. 2011).

Some of the interviewees expressed strong views about having accepted their skin issues as a given condition that could not resolve or retreat. This indicates that these wet workers will possibly not seek further support within or outside work and will continue to work whilst experiencing skin issues. It is extremely important to investigate further this belief/behaviour as it is possible to: improve the HCWs skin health and well-being, prevent further symptom deterioration and minimise the risk of infection. Active OIHD can discourage HCWs and particularly nurses from adhering to adequate hand hygiene practices due to the pain and discomfort of the symptoms (Madan et al. 2016). Irrespective of the skin issues severity, carrying out wet work whilst experiencing skin issues can have adverse and long-term effects of the wet workers' health as well as put the patient care at risk. It should be noted that individuals with hand dermatitis have a 50% likelihood of being colonised with Staphylococcus aureus (Haslund et al. 2009). Although theoretical, there is still the risk of a HCW with OIHD infected by methicillin-resistant Staphylococcus aureus (MRSA) transmitting this infection to patients (Madan et al. 2016).

Section v)

In section (v) the interviewees discussed their thoughts regarding skin health and care at the workplace. Following framework data analysis and higher classification of the interviewees' responses, three classes for skin health and care at work emerged: i) Facilitators, ii) Inhibitors and iii) Physical and Mental Effects of skin issues. Each of these classes contained a relevant set of categories. All interviewees agreed that skin health and care was important to them as it was part of their professional role. Similar beliefs were observed amongst UK NHS nurses regarding the use of moisturisers after hand washing (Burke et al. 2018).

In the class of facilitators for skin health and care at work, the interviewees identified categories that concerned influences from the work environment (e.g. team work, working efficiently, type of work), as well as from management (e.g. supportive mechanisms, time available to apply moisturisers) and personal aspirations and beliefs (e.g. self-awareness of skin care at work, there should be no obstacles for skin care). Good hand hygiene practices among HCWs has a long tradition associated with exposure to hand hygiene campaigns (Pittet et al. 2000). Compliance, however, with good hand hygiene practices was perceived by the HCWs to be effective by peer pressure (from superiors and from colleagues), social pressure from patients and the belief that it prevents HAI (Sax et al. 2007). It is evident that the facilitators of skin care at work consist of a combination of factors complementing each other as they concern the individual's actions, the workplace environment and the type of work. Further research is required in order to ascertain whether combining these factors in a complex intervention can develop a successful mechanism for preventing OIHD. Multifaceted implementation strategy in relation to knowledge and awareness for enhancing the prevention of OIHD in healthcare has been effective and recommended to be used in practice (van der Meer 2014).

With regards to the class of skin health and care inhibitors, the categories identified concerned various barriers; the type of work carried out (e.g. working in community, in patients' homes, where hand washing facilities and products are different, different hand hygiene practices such as scrubbing, awareness of appropriate use of PPE, staff shortages which resulted to working more consecutive shifts, looking after more patients and, therefore, increased frequency of hand hygiene practices), reduced time for skin care due to staffing levels, patient care demands, and the lack of supportive mechanisms/interventions at work. Shortcomings to skin care have been previously associated to practical implementation, and reduced motivation in nurses (Grosse-Schutte 2011). The identified inhibitors described above are significant and pragmatic factors to involve when informing and designing the development of an intervention for preventing OIHD amongst wet workers.

The class of physical and mental effects of skin issues at work set out key messages that wet workers bear in mind. The interviewees identified physical and mental components that affected their skin health and care which originated in their beliefs, experiences, knowledge and perceptions. This class consisted of categories multifaceted in nature: risk of infection (exposing oneself and patients to infection when skin is not intact), visual and sensory aspects (skin issues look embarrassing, patients' perception about the professionalism of the wet worker can be obscured, experiencing pain when working), management of skin issues (difficult and lengthy in time) and quality of life outside work (restrictive in enjoying activities outside work and not looking healthy).

It is evident that skin health and care at work is of a multidimensional nature in the way it impacts the wet worker in and outside work on a physical and mental level. Healthcare workers' knowledge and beliefs towards OIHD have been previously associated with their behaviour towards its management and prevention (Burke et al. 2018). This supports the importance of focusing future research around behavioural change intervention to optimise skin care at work and reduce the occurrence of OIHD (Madan et al. 2016; Sax et al. 2007).

6.5.3 Limitations

Quantitative

The choice of using a standardised, validated questionnaire specific to occupational skin diseases such as the NOSQ-2002/SHORT was appropriate to the DPP project and fulfilled the purposes of Study III as discussed in chapter 3 while minimising bias (Flyvholm et al. 2002). Since NOSQ-2002/SHORT is a self-reporting and non-diagnostic tool for eczema on hands and wrists/forearms, caution and care were applied prior to making further conclusions or generalising the findings. This does not imply that the validity of the tool was not adequate but rather to consider that underestimation of OIHD prevalence may be attributed to self-reporting (Shamout and Adisesh 2016). Another limitation of the quantitative part of Study III, was the low response rate to the survey (for both electronic and printed questionnaires). The low response rate of the electronic survey could be attributed to the working environment of wet workers (clinical areas) and deprived of easy/immediate access to personal computer facilities. Sinclair et al. (2012) compared the response rates and cost-effectiveness for a community-based survey. A total of 1677 responses were received, comprising 30.2% telephone survey, followed by 10.5% personalised postal survey, 7.5% generic survey, 4.7% internet personalised survey and 2.2% internet generic survey. The 2.2% response rate of the internet generic survey in Sinclair et al. (2012) is much lower than the response rate achieved during the quantitative approach of this study (16.5%). Although the findings of Sinclair et al. (2012) suggested that postal surveys had the highest response rates, Brtnikova et al. (2018) described a method (survey reminders over time) that maximised response rates of electronic surveys amongst primary care physicians. A total of 13 separate surveys were conducted over a period of 6 years. The online surveys had consistently higher response rates (74%) than that of the postal surveys (62%) (Brtnikova et al. 2018). It is, therefore, evident that the use of electronic survey methods did not additionally contribute to lowering the response rate notably.

Another factor that may have contributed to the low response rate could be the internet browser version used in some older NHS Grampian computers at the time of the survey. As a result, this may have affected the opening of the survey link or progressing to the survey after clicking the consent button. The researcher was aware of such limitation and has offered clear instructions on the first page of the online survey. The survey link was also compatible with mobile use. In spite of the limitations discussed above, both the use of NOSQ-2002/SHORT as well as the lower response rate were deemed most appropriate for the purposes of Study III. Interpretation of the findings from the survey and the interviews was, therefore, carried out with caution.

Qualitative

As with all the different approaches of qualitative data analysis, the procedure of analysing the data is time consuming (Ritchie et al. 2014). The process of categorising and coding data separates it from the interviewee who produced it, as well as from the interactive nature of the interview (Bowling 2014). Gale et al. (2013) argued that using the framework method for the analysis of qualitative data in multi-disciplinary health research has pitfalls in the analysis and interpretation of data even amongst trained researchers. A tendency to quantify qualitative data for example, 'five out of ten interviewees reported x phenomenon' is a usual phenomenon (Gale et al. 2013). In this study quantification of some of the data takes place due to the nature of the semi-structured interviews that were carried out where the questions were closed. The researcher consulted with her principal supervisor during the stage of framework analysis to peer review the coding, index and chart the data into dimensions, elements and finally classify the data, which contributed to reducing bias and keeping to the agreed project timeline.

The researcher employed certain procedures during the stage of framework analysis for the accuracy of the findings as discussed above. It is equally important to acknowledge and clarify the bias the researcher brought to study (Creswell 2014). The researcher's background of having worked as an OH nurse advisor with specialty in skin at the same organisation where Study III took place, could introduce subconscious or conscious bias (Bowling 2014). For example, the researcher could have asked leading questions when interviewing the participants, due to holding extensive experience in nursing consultations and looking after HCWs with skin issues. In order to avoid asking leading questions, the researcher was constantly mindful of the following: to follow the interview schedule questions, to allow time for the participants to respond to the questions, and when further clarification or explanation was required for a question, to prompt the interviewee in an objective manner (for example, 'what were your thoughts regarding the advice you received?'). Creswell (2014) argued that researchers who have spent prolonged times in the field they investigate, develop in-depth understanding of the phenomenon of interest. Extensive experience of a researcher in the interviewee's settings, contributes to credible, valid and accurate findings (Creswell 2014).

The relatively small number of the sample and sub-sample in Study III may limit the applicability of the results to other organisations, however, the findings that emerged from this mixed-method approach will be used to design and pilot an evidence-based intervention aiming to prevent OIHD which will then have the potential of application to other wet-work organisations.

6.6 Conclusion & Implications for practice & research

The majority of a representative sample of NHS Grampian wet workers had experienced skin issues at some point within the last 12 months (at the time of the survey). Soaps, cleansers, PPE, wet work and their combinations appeared to be exacerbating factors of the self-declared skin issues, affecting the wet workers' hands, wrists and forearms. Strong association between the skin issues and the development of atopic symptoms was observed which could lead to the development of long-term skin problems and have a negative effect on the employment of the wet workers. The sub-sample of wet workers who took part in the interviews of Study III indicated that skin health and care at work is multifaceted in nature and affects the wet workers in various ways both in and outside work.

Study III provided evidence regarding skin health and care facilitators, inhibitors and the physical and mental effects skin issues have on HCWs. Useful information can be drawn from the findings and used in practice to change the HCWs' approach towards the prevention of OIHD. Wet workers, managers as well as the organisation should play an active role in creating the opportunities to implement such change.

The most salient implication of Study III for research is the need for developing an evidence-based intervention for the prevention of OIHD. Skin health and care facilitators, inhibitors and the physical and mental effects of skin issues on HCWs need to be studied further in order to:

i) study and ascertain how these factors can change behavioural aspects of HCWs towards skin health and care at work to best prevent OIHD

ii) inform the development of an evidence-based intervention.

Chapter 7

Discussion & Conclusions

7.1 Introduction to the chapter

This chapter provides a brief overview of the overall aim of the thesis as well as the aim of each of the three studies and outlines the key findings. The originality of this research project is highlighted and discussion takes place regarding future work related to the development and implementation of the proposed intervention. Finally, the impact of the project will also be discussed prior to outlining the main conclusions.

7.2 Overall aim and aim of each study

This DPP research project aimed to inform the development of an evidence-based intervention designed to promote self-care and to prevent OIHD in HCWs within NHS Grampian and other healthcare institutions. The research was conducted in three studies, each of which offered a standalone contribution.

Study I:

The aim of Study I was to determine the reported period prevalence and incidence of OIHD in wet workers and in particular amongst HCWs in Great Britain and Grampian region between 2010 and 2015.

Study II:

The aim of the systematic review was to identify, appraise and synthesise the best available evidence on the effectiveness of moisturisers, barrier creams, protective gloves, skin protection education and complex interventions (a combination of two or more of the interventions listed here) in preventing OIHD in wet workers, comparing each intervention to an alternative intervention or to usual care (workers' regular skin care regimen).

Study III:

The aims of the final study were:

i) to explore the distribution and determinants of OIHD in a sample of HCWs referred to OHS in NHS Grampian in 2015 and
ii) to explore the demographics of the HCWs as well as their experiences, perceptions and needs in relation to prevention of OIHD using a mixed-methods approach.

7.3 Key findings

The findings from each of the three studies were discussed in the corresponding chapters. This section will highlight the key findings of each of the three studies with a view to developing an evidence–based intervention.

7.3.1 Study I findings

Study I found that the period prevalence of OIHD on national and local level during the period 2010 and 2015 was overall small. Despite the small numbers, Study I also found that, in a sample of HCWs in NHS Grampian, both incidence and prevalence rates were increasing annually during the same period. This is important as it may be indicative that larger numbers of HCWs are currently affected by OIHD at work than during the time this study was conducted.

It was found that HCW's within some occupational groups have a greater propensity for pre-existing skin conditions. This association indicated that HCWs with pre-existing skin conditions belonging to the identified occupational groups (nursing/midwifery) are more likely to be affected by OIHD. Hence, a larger sample will need to be considered for future work, following on this DPP project, targeting HCWs from the identified high-risk occupational groups.

7.3.2 Study II findings

In Study II, no primary prevention studies were found where all participants were without pre-existing skin conditions. Furthermore, it was not possible to extract separately the data relating to participants without pre-existing skin conditions from within the studies that employed mixed populations. Hence, it was not possible to ascertain whether any skin changes were due to the effectiveness of the intervention(s) or due to the improvement of symptoms related to pre-existing skin conditions. This finding implies that there are gaps in the design of interventions for the prevention of OIHD in a way the one can confidently assess their effectiveness. It is, therefore, necessary to ensure that data of wet workers with and without pre-existing skin conditions are analysed separately in order to understand whether any changes are attributed to the intervention or due to symptom improvement.

7.3.3 Study III findings

The key findings from the quantitative part of Study III suggested that wet work, hand hygiene products as well as use of PPE (particularly rubber gloves) were risk factors for both the development and/or exacerbation of OIHD amongst HCWs. Strong association was found between OIHD and the development of atopic symptoms. The findings highlighted that onset of OIHD in most cases can develop into atopy (tendency to develop allergies) which has the potential for severe and long-term impact on the health and well-being of the individual.

In the qualitative part of Study III, a higher-order classification was constructed and yielded a set of three classes associated with the HCWS' skin health and care at work as following: i) facilitators, ii) inhibitors and iii) physical and mental effects of skin issues.

The key findings pertaining to the skin health and care facilitators were hand hygiene/care products, teamwork and provision of supportive mechanisms at work for skin care. In addition, skin care self-awareness and adequate time to carry out skin care at work were amongst the most strongly voiced facilitators.

With regards to skin health and care inhibitors, key findings were the lack of support at work including lack of understanding from the patients, work environment and lack of information/training/knowledge at work for skin care.

The key findings relating to physical and mental effects of skin issues, concerned the increased risk of infection, visual and sensory aspects, as well as quality of life outside work. Interestingly, a range of psychological issues were raised by the interviewees in relation to the effects of skin issues. Specifically, feelings of embarrassment, being aware of how patients will perceive the HCWs (fit or not fit to be looking after patients), not looking professional (to themselves, their colleagues and patients) and having distorted self-image about their skin.

The aforementioned key findings, were most frequently discussed by the HCWs and subsequently were key elements requiring change within the workplace in order to improve health and well-being of the wet-work population. The findings, therefore, provided the evidence-base towards developing an intervention in order to ascertain how they can influence HCWs' behaviour to prevent OIHD.

7.3.4 Strengths and limitations

The strengths and limitations of each of the studies were discussed in the corresponding chapters of the three studies of the thesis. This section provides a discussion of the overall strengths and limitations of this DPP project.

Strengths

The major strength of this DPP project is its originality. In a literature review, Edwards (2014) concluded that originality in a PhD can be subjective. For a PhD student, originality of research has traditionally been associated with contribution of knowledge in the field of interest through data analysis and clear arguments and opinions supported with evidence (Edwards 2014). She further argued that originality should also express the researcher's own voice and coherently defend with constructive and logical arguments the choices they made throughout the research project. Table 7.1 illustrates the nine concepts of originality of research.

Table 7.1 Nine concepts of originality in research

1. Conducting empirical research that has not been done before
2. Undertaking original synthesis
3. Interpreting existing material in new ways
4. Undertaking something in the UK that has only been done abroad
5. Using a particular technique in a new way
6. Producing new evidence regarding an old issue
7. Being cross-disciplinary and using alternative methodologies
8. Researching unexplored areas in an original way
9. Providing knowledge in an original way

Adapted by Edwards 2014

Various concepts of originality relate to this DPP project. In Study I, particularly, the approach of reviewing the databases represented the concept of 'providing evidence in an original way' as well 'interpreting existing material in new ways'. The findings of Study I contributed to the existing body of knowledge by providing a greater insight of the characteristics of HCWs affected by OIHD in NHS Grampian and also showed that there is strong association between certain occupations with pre-existing skin condition and the development of OIHD. Study II also represented the concept of 'interpreting existing material in new ways' as well as 'producing new evidence regarding an old issue' by reviewing the world-wide literature to identify the best available evidence on the effectiveness of interventions to prevent OIHD. The systematic review highlighted a gap in the literature regarding studies where the analysis of their findings concerned mixed populations (wet workers with and without pre-existing skin conditions) which consequently could not assess the effectiveness of interventions successfully. Study III demonstrated originality in 'researching unexplored areas in an original way' by conducting a mixed-methods study. The outcomes of study III specifically provided the evidence base for the development of an educational intervention. The findings indicated that perceived facilitators, inhibitors and physical and mental health effects about skin health and care at the workplace are the key areas around which the development of an educational intervention could optimise skin care practices for HCWs at work.

Integration of the views, experiences and perspectives of the HCWs played a vital role in enhancing the depth of the data obtained. In the researcher's view, the most important element of developing an intervention was asking the HCWs their beliefs on how OIHD can be best prevented. In this way, the HCWs' perception of what is considered an issue can provide useful information which can then be incorporated with the extant knowledge. Moreover, the researcher was able to identify through the HCWs' perceptions of the fundamental components of an educational intervention towards prevention of OIHD.

Limitations

A two year delay in obtaining R&D/Caldicott approval from NHS Grampian was one of the most significant limitations of this DPP project. The length of this delay was extremely restrictive for the researcher as Studies I and III could not commence until ethical approval was obtained from NHS Grampian.

Conducting this DPP project on a part-time basis was arguably a limitation for the researcher. Working on a full-time basis in NHS Grampian as a nurse adviser had valuable advantages, transferable to research; it enabled the researcher to continue observing via day-to-day practice the HCWs' perceptions, views and opinions on skin health and care matters which enhanced her understanding and experience on the subject. Conversely, it made the researcher's approach to the thesis fragmented due to the lack of continuity in studying.

Reflexivity of researchers relates to how they become aware of the effects of their experiences, culture and personal background on the interpretations (Creswell 2014). The researcher has previously conducted research amongst HCWs in Greece using both quantitative and qualitative approaches to collect and analyse data and used a theoretical framework to underpin her research. Adopting pragmatic and positivist paradigms in the three studies allowed the researcher to look into the project through a post-positivist lens. The two stances ensured that the DPP project was not focused only on one philosophical paradigm and consequently allowed the incorporation of various methods in eliciting information from all three studies (Silverman 2016). Moreover, the extensive clinical experience of the researcher in conducting skin clinics as part of her day-to-day practice may have influenced her understanding and interpretation of the data especially during the interviews in Study III. In order to minimise the researcher's bias, the interview schedule and the classification of the data (during the coding and analysis stages) were peer reviewed by the researcher's supervisory team.

Although no formal guidance exists on how to apply the TDF, extensive use of the framework is reported in implementation research (Atkins et al. 2017). For the purposes of this DPP project, the TDF was applied to justify the rationale of the research, construct the overall aim and consider the methodological stances. Above all, the TDF offered adequate flexibility to this exploratory project to incorporate mixed-methods into the research in order to elicit the best evidence and information for the design and development of an educational intervention based on the MRC guidance for developing and evaluating complex interventions.

7.4 Use of theory in the development of an intervention

Whilst the findings of this thesis have furthered the understanding regarding the determinants of skin health and care at the workplace, additional work would be required prior to implementing an intervention. An important goal would be for HCWs to foster behaviours targeted at reducing the formation of OIHD. It is therefore, imperative to consider the identified findings as potential behavioural intervention targets. In order to achieve this, the first step during the intervention design would be to define the problem in behavioural terms. In order to improve HCWs' behaviour towards skin health and care at work, theories of health behaviour change have been considered. Newer perspectives regarding health behaviour emphasise that: "health and health behaviors are determined by influences at multiple levels, including personal (i.e., biological, psychological), organizational/institutional, environmental (i.e., both social and physical), and policy levels…Historically, many health fields have focused on individual-level health determinants and interventions." (U.S. Department of Health and Human Services 2019). Skin health and care can thus be considered as health behaviour, therefore, using health psychology theories to inform the development of an intervention to prevent OIHD is appropriate. Matterne et al. (2011) tested three different theory models (Theory Planned Behaviour, Prototype-Willingness Model and Health Action Process Approach) aimed at predicting skin protection behaviour on individuals with OSD. While each model had unique concepts in predicting behaviour (e.g. attitudes, perceptions regarding skin protection, social norms) the authors suggested that future research should consider combinations of these models to predict skin protection behaviours.

Although this thesis has not focused specifically on HCWs' behaviours, useful information has been drawn from the key findings of all three studies to better understand and define skin issues in behavioural terms, helping thus, towards the prevention of OIHD. Selecting a behaviour change approach to underpin the development of the intervention may not incorporate the findings from all three studies, it is, nevertheless, the most appropriate approach to address the complex nature of OIHD. Brief intervention conversely, as a behaviour change approach would not be suitable to ensure research robustness based on the multifaceted nature of this thesis' findings. Although brief interventions can be delivered by anyone that has had appropriate training, the length (typically lasts a few minutes), breadth and depth (basic advice is given orally with or without other support/follow-up) of advice given would not suffice to change skin health and care behaviour (NICE 2014).

As discussed above, the TDF could be applied to define the problem in terms of behaviour, in order to understand:

- existing behaviours within different contexts
- the target behaviours of HCWs

- the full range of possible interventions
- how to identify specific behavioural change techniques

Figure 7.1 shows the key findings of this thesis mapped across the relevant TDF domains.

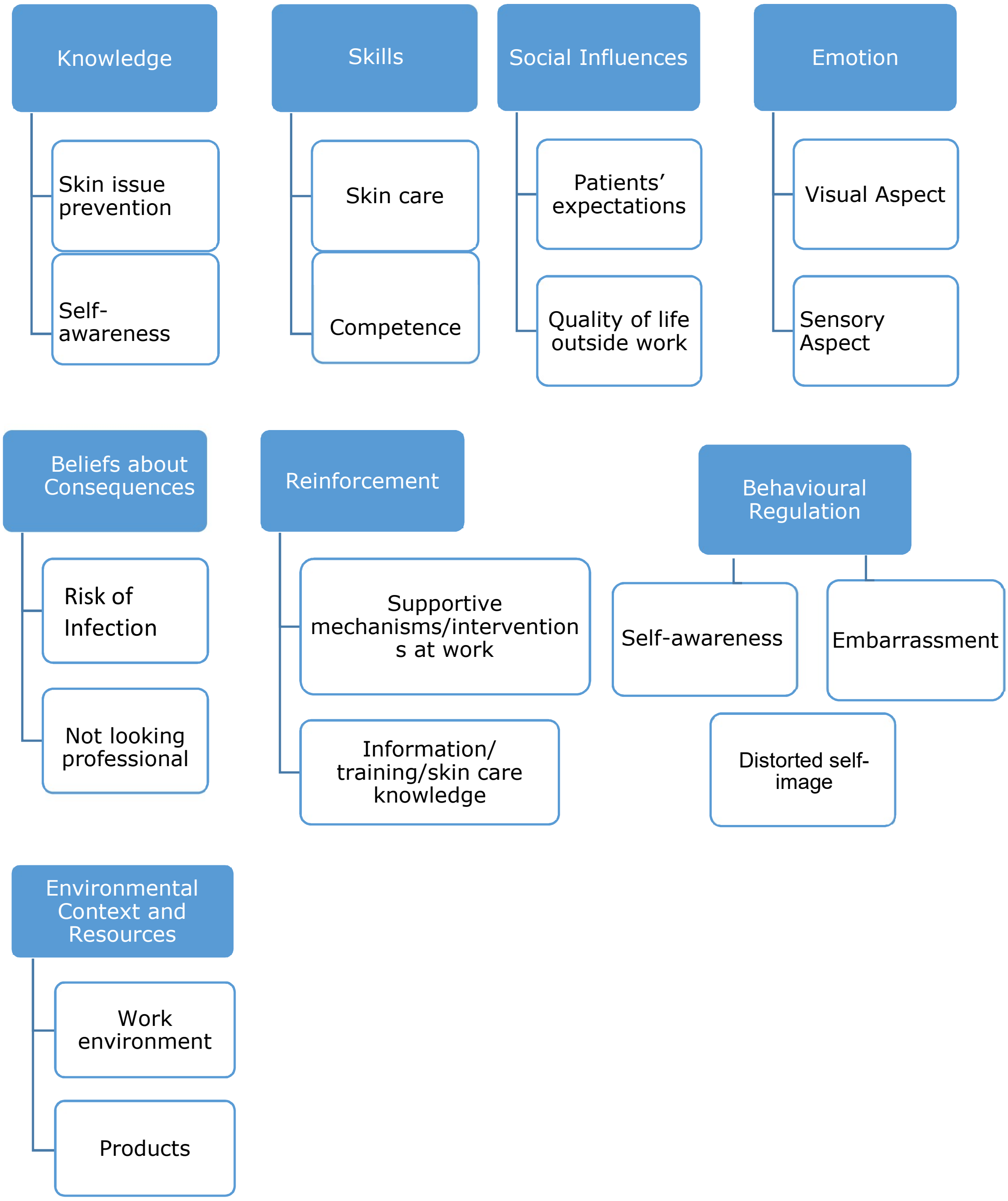


Figure 7.1 TDF Domains and associated findings of the DPP project mapped across relevant domains

The uniqueness of TDF lies in the use of multiple behaviour change domains that incorporate broad categories of intervention functions (Michie et al. 2005). Each function includes one or more behaviour change technique which has the potential to link the TDF to the implementation problem and inform change techniques (Michie et al. 2005). The major strengths of the TDF are within its capacity: i) to represent organisational and individual behaviour and ii) to obtain a complete set of beliefs with the potential of changing health behaviour (Francis O'Connor and Curran 2012). While the TDF can be used to enhance the understanding of behaviour change in relation to the key findings of this study, a behaviour change model will be employed to specify the range of techniques used to change behaviour determinants within the context of healthcare. Michie et al. (2011) proposed a behaviour system that incorporated three fundamental conditions: i) capability, ii) opportunity and iii) motivation (COM-B model). The COM-B model forms a 'behaviour change wheel' (BCW) which incorporates and utilises a number of elements/phases from TDF and COM-B. The BCW occurs as an interaction of three conditions, capability, opportunity and motivation (Michie 2011). These components are interlinked and can enact the targeted behaviour (Michie 2011). At this stage, eight of the 14 domains of the TDF appear to be relevant to the key findings of Study III as depicted in Figure 7.1. Alternatively, each of the eight TDF domains can be mapped to the COM-B model (Cane, O'Connor and Michie 2012). Both models could be used by the intervention developers to underpin theory as well as determine which factors could influence behaviour change amongst HCWs (Michie 2011).

7.5 Future research

Future work must now follow on from this thesis and focus on the development, piloting and evaluation of an evidence-based educational intervention for the prevention of OIHD amongst HCWs. Although the MRC guidance does not provide explicit steps on how to develop complex interventions, it advises on the incorporation of the available evidence with the appropriate theory which is what the researcher is intending to do for the future work as explained above (Craig et al. 2008). Guidance from the MRC for developing and evaluating complex interventions has outlined the need for incorporating behavioural change theory into the development of the intervention (Craig et al. 2008).

The HCWs' voices regarding skin health and care facilitators, inhibitors and physical and mental effects at work, was pivotal in determining the type of intervention needed to prevent OIHD. Developing an educational intervention marks the culmination of the key findings of this thesis. Furthermore, it keeps in line with recent studies that have identified gaps in workplace education for the prevention of OIHD (Bauer et al. 2018; Gupta et al. 2018). Although there are studies that have focused on interventions involving educational programs for the prevention of skin disease at work, the actual training experience of the workers has not been assessed or reported in detail (Rowley et al. 2016; Holness and Kudla 2012). Healthcare workers' training experience is a vital element to consider in enhancing understanding of how to change behaviour. Training experience during educational interventions can provide valuable information on HCWs' perceptions regarding various components of its content which in turn can determine behaviour change. Furthermore, the HCWs's experiences in relation to skin health and care facilitators, inhibitors and physical and mental effects also provided the evidence-base for identifying and targeting behavioural determinants.

Future work will allow better understanding and will hopefully contribute towards a change of behaviour on an individual and organizational level by addressing the findings of this thesis. The section below outlines the proposed future work based on the key findings that emerged from this thesis by using TDF theory to inform the design, piloting and evaluation of educational intervention for the prevention of OIHD.

7.5.1 Developing an educational intervention for the prevention of OIHD amongst HCWs in NHS Grampian

The next steps during the development approach require identification of the best suited educational intervention. In order to ensure impact on behaviour an intervention should employ the following three characteristics: i) theoretical basis, ii) behaviour change theory and techniques and iii) the mode of delivery (Webb et al. 2010). As previously discussed, the use of TDF in combination with COM-B are most appropriate theories to underpin the proposed research, to develop, that is, the evidence-based intervention for preventing OIHD amongst HCWs in NHS Grampian. Moreover, review of the available training programmes that have been used in studies previously and their strengths and limitations took place. Use of brochures, information leaflets/posters, face to face training of workers and managers, seminars as well as interventions that incorporate more behaviour change techniques were considered (Rowley et al. 2016; van der Meer et al 2014; Lofler et al. 2006; Held et al. 2001). The use of internet as a medium to deliver interventions targeted at behavioural change has been increasing and has also been considered for the delivery of the proposed intervention (Webb et al. 2010). One of the merits of using internet-based interventions has been that their effectiveness has been associated with more extensive use of theory (Webb et al. 2010). A behavioural change model developed within a scientific framework purported that effective internet interventions produce behaviour change and symptom improvement (Ritterband et al. 2009). Internet interventions for depression and anxiety based on cognitive behavioural therapy (CBT) have shown to be effective over the long time (Griffiths, Farrer and Christensen 2010).

A multicomponent intervention design phase would take place first consisting of education and support (role modelling/support groups) and provision of products (hand creams and/or alcohol-based hand rubs). It is anticipated that a co-design of the intervention with OHS staff and potential users (wet-workers) would seek to identify and specify the intervention’s components. Table 7.2 below is a proposed approach of the intervention components and possible methods of delivery. Further consultation with potential users (wet workers) of the intervention will be considered in order to determine the most appropriate and exact methods of delivery at the co-design stage.

Table 7.2 Indicative approach to implement evidence-based multicomponent intervention to prevent OIHD

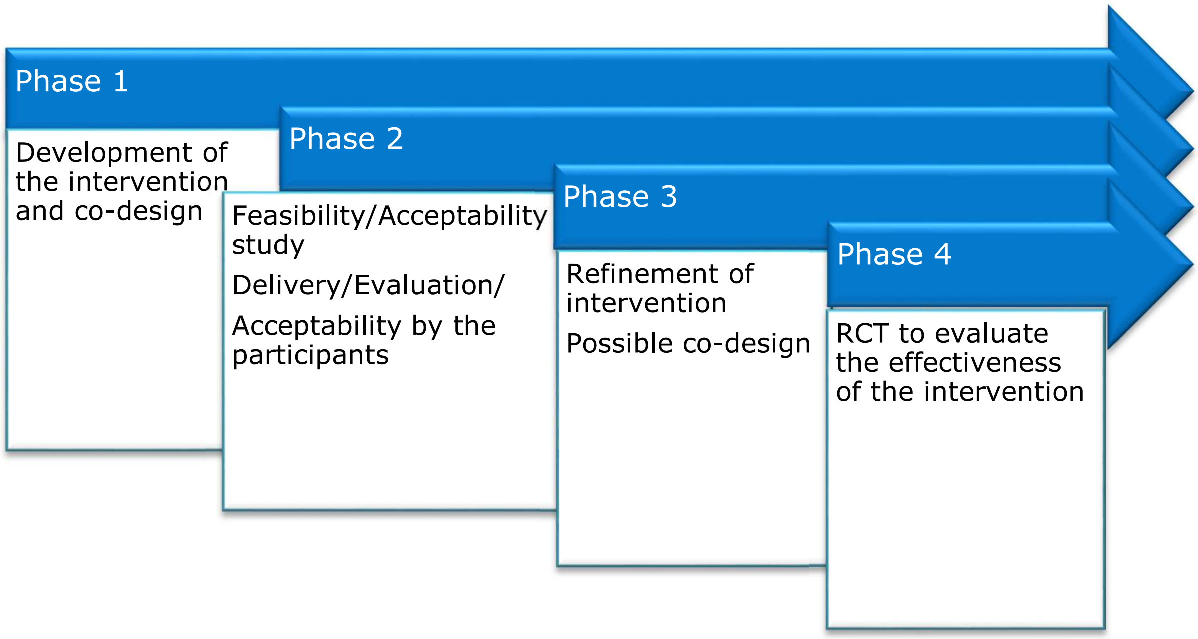
TDF Domain	Key findings mapped across TDF domains	Intervention components	Method of delivery
Knowledge	-Information HCWs have regarding skin issue prevention -Self-awareness/rationale of skin care compliance	-Exploration of OIHD and skin care knowledge amongst HCWs	-Face to face Interviews and/or Questionnaires
Skills	-Skin care competence	-Training programme and information regarding OIHD and skin care	-Face to face training and educational leaflets/brochures
Beliefs about consequences	-Risk of infection for the HCW and the patient -Not looking professional, therefore affects the quality of care given	-Hand hygiene and skin care regime	-Support from skin role model
Reinforcement	-Supportive mechanisms/interventions at work -Information/training/skin care knowledge	-Reinforcement from a skin role model at work -Peer support from colleagues	-Support from skin role model -Key messages in the area of work
Environmental Context and Resources	-Work environment -Products	-Provide moisturisers	-Provide small samples moisturisers
Social Influences	-Patients' expectations -Quality of life outside work	-Use of moisturisers	-Provide small samples moisturisers
Emotion	-Visual aspect -Sensory aspect -Distorted self-image -Embarrassment	-Peer support from colleagues	-Support from skin role model -Support groups using mobile technology/applications

Behavioural regulation	-Self-awareness for skin care	-Compliance with skin care regime at work and at home	-Reminders via internet (emails or use of mobile technology/applications)

The researcher considers this type of approach to be the most feasible and cost-effective framework, as it allows theory incorporation, use of behavioural change techniques and choice of delivery methods.

Based on the results, a series of studies or reviews may be required in order to refine and optimise the design of the intervention. Ultimately the findings will indicate how feasible it is to undertake an RCT to determine the effectiveness of the educational intervention to prevent OIHD in HCWs in NHS Grampian. Figure 7.2 presents a flowchart of the process discussed above.

Figure 7.2 Flowchart of process



The outcomes of this thesis have enabled the proposal of an evidence-based intervention to prevent OIHS amongst HCWs targeting behaviour change. The following section outlines the proposed key research question, philosophy, methodology and methods of the proposed study.

Research Question:

What is the effectiveness of an educational intervention for the prevention of OIHD amongst HCWs in NHS Grampian?

Philosophy:

The study proposed will adopt a pragmatic approach in order to gather all types of data (quantitative and qualitative) to answer the research question.

Methodology and methods:

A mixed methodology employing an explanatory sequential design will allow the modelling of the intervention process. To better understand the identified behaviours and develop an intervention based upon effective principles of behaviour change, the COM-B conditions will be employed (i.e. physical and psychological abilities of wet workers as well as reflective/automatic mechanisms). To test its feasibility, a pilot study will be conducted using the findings of this DPP study with aspects of TDF. A combination of quantitative and qualitative tools will be used in order to understand the barriers to participation and estimate response rates (Craig et al. 2008). In order to identify OIHD, tools such as NOSQ will be employed. This standardised questionnaire is tailored to specific occupational groups for surveying hand dermatitis and risk factors in workplaces or in a population. In-depth interviews or focus groups of purposive samples will seek to further explore the determinants of HCWs's behaviours in relation to skin health and care at work in relation to the TDF and COM-B domains.

Outcome measures:

Quantitative

OIHD measured using the NOSQ and visual skin checks carried out by trained healthcare professionals to improve accuracy.

Qualitative

Behavioural determinants

OIHD preventative behaviour

Knowledge, awareness and experiences

Qualitative determinants of behaviour change following the educational intervention, will be measured using NOSQ (considering modification of some question sets to in order to measure behaviour changes related to the educational intervention) and by employing likert scale questions in the in-depth interviewing.

7.6 Impact of research

The UK Research and Innovation body defines research impact as the 'demonstrable contribution that excellent research makes to society and the economy' (UK Research and Innovation 2019a). The UK Research and Innovation (2019) body suggested that research impact should be achieved on academic, economic and societal level. To ensure research impact and maximise its application, it should occur through the sharing of knowledge and innovation, the invention of new products, the development of new and improvement of existing policies and public services as well as by enhancing the quality of life and health (UK Research and Innovation 2019a). In terms of this thesis, the pathway to impact outlined by the UK Research and Innovation is given in figure 7.3 below.

The pathway that relates to this thesis is:

- Publication in peer reviewed journals
- Presentation of results in national and international conferences
- Feedback the research findings back to the participants of study III and the Occupational Health Services department
- Press release of the DPP project results through the staff newspaper of NHS Grampian as well as via NHS Grampian generic Globals emails
- Presentation of the results to members of staff and students in the School of Nursing and Midwifery of Robert Gordon University
- Develop and pilot of the proposed intervention

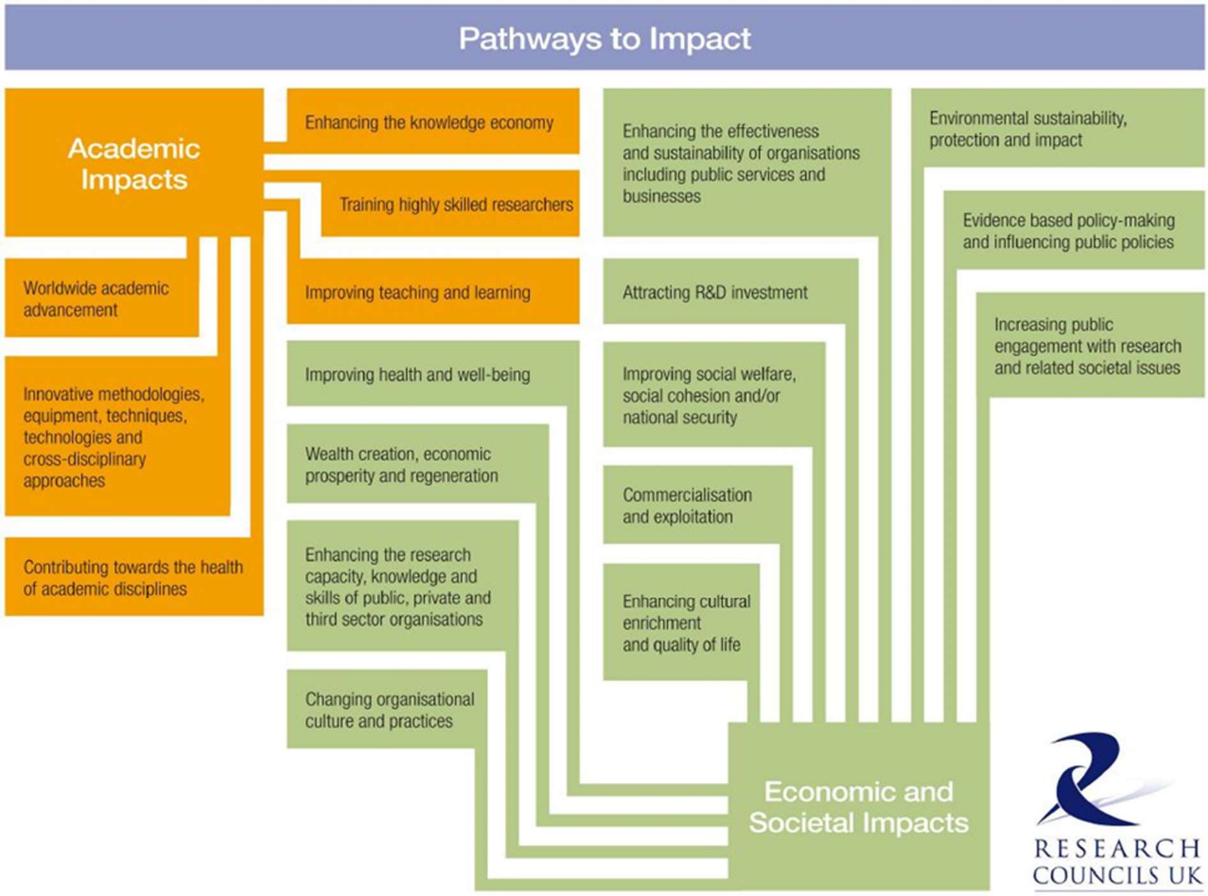


Figure 7.3 "Pathways to Impact". Reproduced with permission UK Research and Innovation 2019b.

Figure 7.3 represents how the former Research Councils UK (RCUK) conveyed understanding of the academic, economic and societal impacts derived from research[1].

Footnote

[1]UK Research and Innovation (UKRI), is the new body which has supplanted the role of RCUK. The UKRI continues to endorse "Pathways to impact" to encourage and foster research excellence. Because of the importance for universities to demonstrate the impact of their research for the Research Excellence Framework (REF) exercise, UKRI have provided more resources to support such efforts through the National Co-ordinating Centre for Public Engagement (2019).

Figure 7.4 illustrates the DPP project's research impact of the UK Research and Innovation body as discussed above.

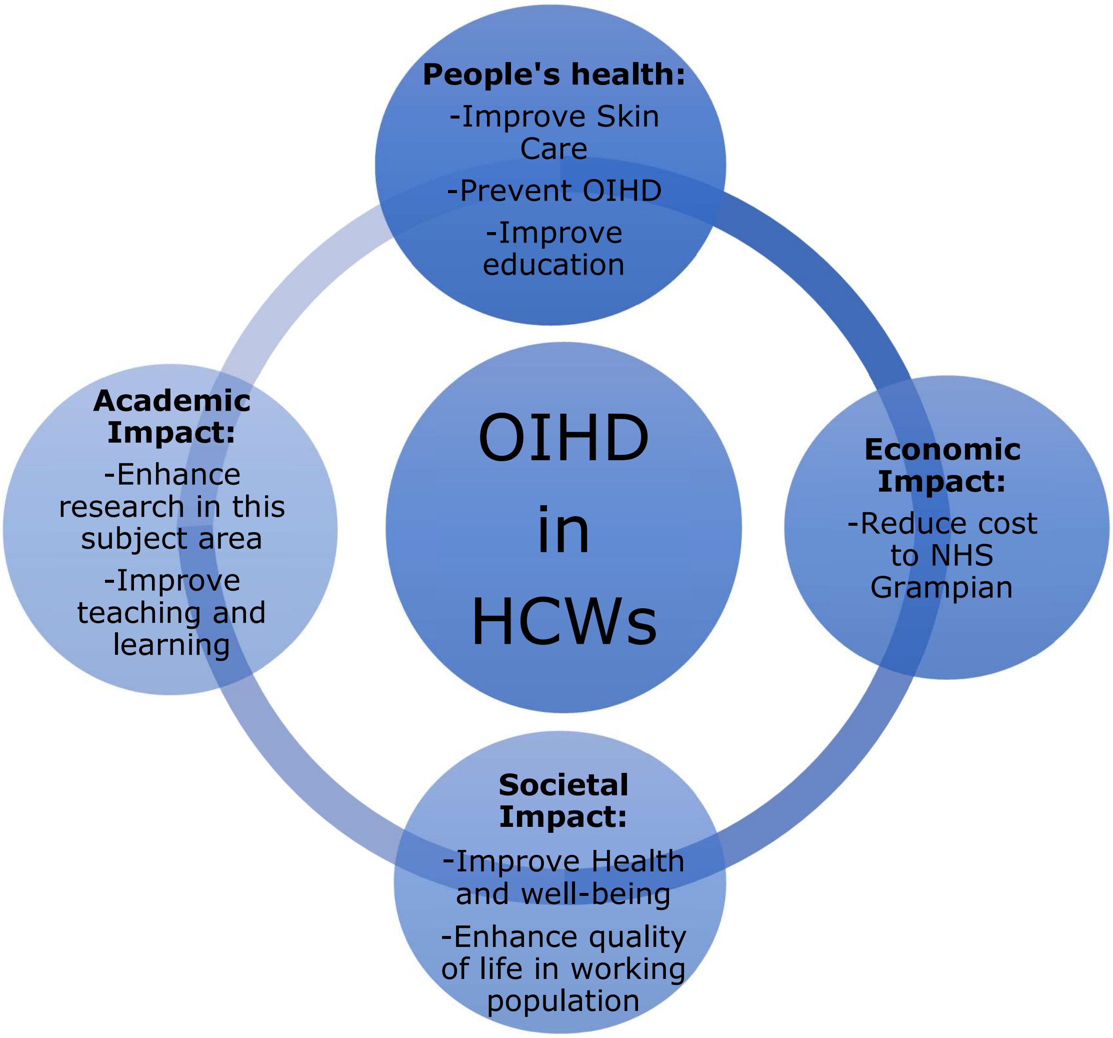


Figure 7.4 DPP project research impact

This DPP research project exhibited impact in that it:

- enhanced the knowledge of the researcher herself in terms of research learning and development during the past seven years. The researcher undertook a two-year taught course in relation to applied research paradigms, methodologies and methods, enriching her professional practice and critical analysis
- contributed towards creating new knowledge among the research supervisory team specifically around the aspects of OIHD

- may lead to improved skin health and wellbeing of the participants of the DPP project specifically those who took part in Study III
- may enhance the quality of life in HCWs in NHS Grampian and other wet work organisations
- may enhance the likelihood of culminating this project by further developing, piloting and implementing the proposed evidence-based intervention to HCWs in NHS Grampian
- may change organisational culture and practices

7.7 Conclusion

Occupational Irritant Hand Dermatitis is a significant problem amongst wet workers and particularly HCWs. This research has created new knowledge on skin health and care of HCWs at workplace by means of mixed methods comprising quantitative survey, quantitative systematic review and mixed methods (questionnaire and interviews) approach. The findings of this research have created an evidence-base which may be used to design, pilot and implement a multicomponent educational intervention aiming to change behaviour of HCWs towards skin health and care at work.

The HCWs who took part in this research demonstrated that skin health and care at work is of paramount importance to them both at personal and professional level. Maintaining healthy skin signified for the HCWs the ability to look after themselves, their patients, minimise and prevent the risk of infection and optimise the quality of their lives outside work. Healthcare workers also voiced their thoughts regarding shortcomings to skin care at work. The type of work carried out, reduced time for skin care due to low staff levels and lack of supportive mechanisms/interventions at work were the key inhibitors of skin care at work.

Additional exploratory work within the healthcare industry is required to understand how the perceived factors for skin health and care at work affect HCWs behaviours and whether a multicomponent intervention can prevent the development of OIHD. The findings of this thesis identified the need for an educational intervention to prevent OIHD amongst the population of HCWs in NHS Grampian. The use of TDF will clearly define and refine the proposed educational intervention amongst HCWs in NHS Grampian to prevent OIHD and enhance the likelihood of research impacting current practice. Moreover, the identified key findings mapped to the relevant TDF domains as determinants of behaviour, will facilitate further mapping to behaviour change techniques (i.e. use of COM-B model) and will be the active ingredients of the proposed intervention. Behaviour change theory will underpin future work ensure scientific rigour, value, depth and effectiveness of the proposed multicomponent intervention.

The prevention of OIHD is important for both HCWs and the hospital environment. Skin health and care at work can have long-term health benefits for the individual, improve patient care, optimise compliance with hand hygiene and skin care protocols, increase productivity and reduce sickness absence which consequently would reduce cost to the NHS. When prevention of OIHD proven effective it can be implemented in other healthcare settings as well as other wet work occupations.

Turning the workplace into a major influence for wet workers' health and well-being would be the ultimate target. Understanding how skin health and care facilitators, inhibitors and physical and mental effects enact as behavioural determinants, eliciting interventions and changing attitudes and behaviours has the potential to benefit wet workers in healthcare. Finally, the promotion of holistic health and well-being at work is of vital importance in creating a healthier working population, prolonging longevity and delivering prosperity to individuals.

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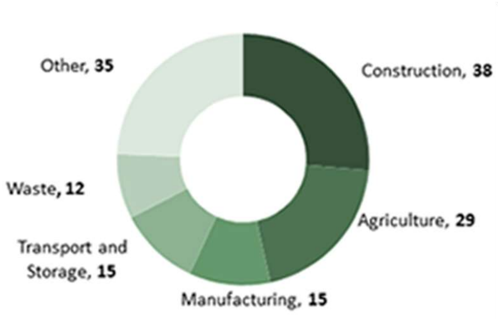
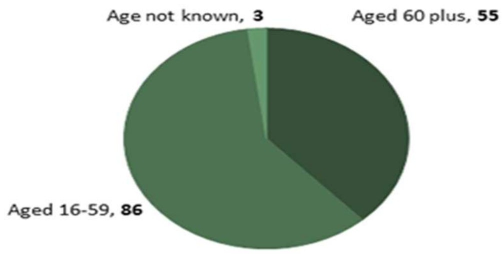
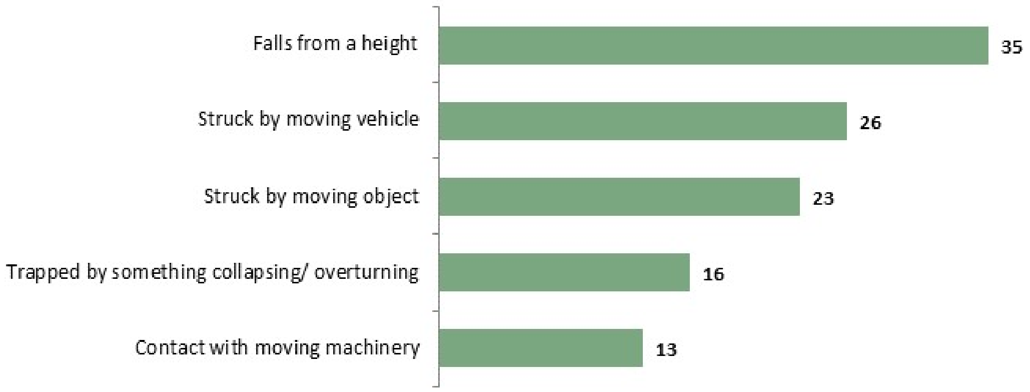
Appendix

Appendix 1.1: Fatal Injuries in Great Britain

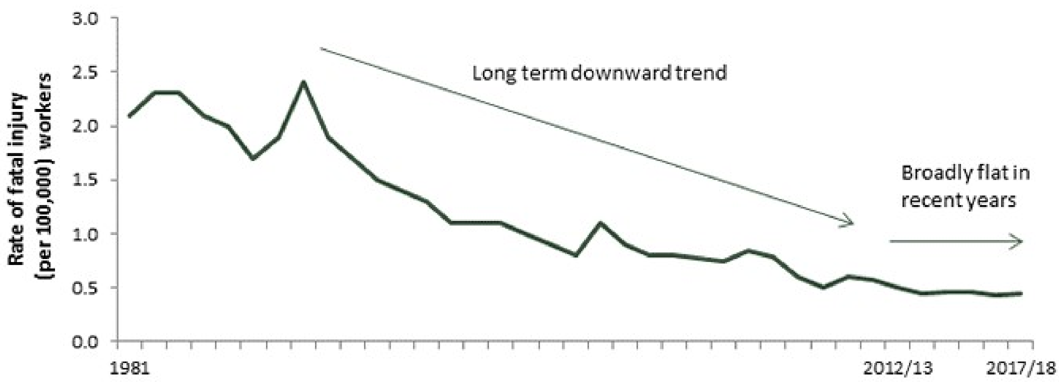




Fatal Injuries to workers by main industry **Fatal injuries to workers by age**



Main kinds of fatal accident for workers

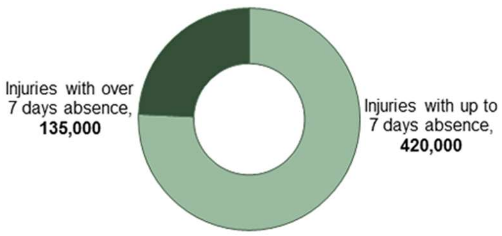


Rate of fatal injury per 100,000 workers

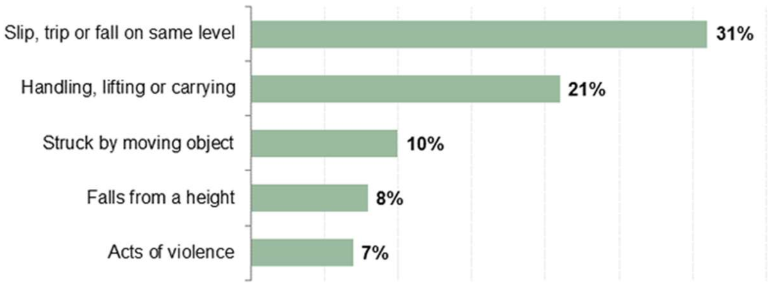
Source Health and Safety Executive 2018e. Available online from:

http://www.hse.gov.uk/statistics/fatals.htm

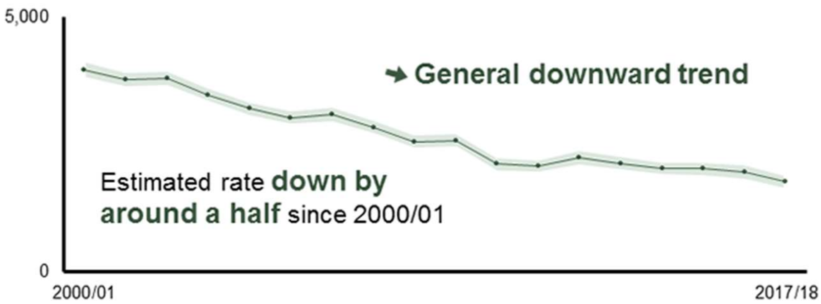
Appendix 1.2: Non-fatal Injuries in Great Britain



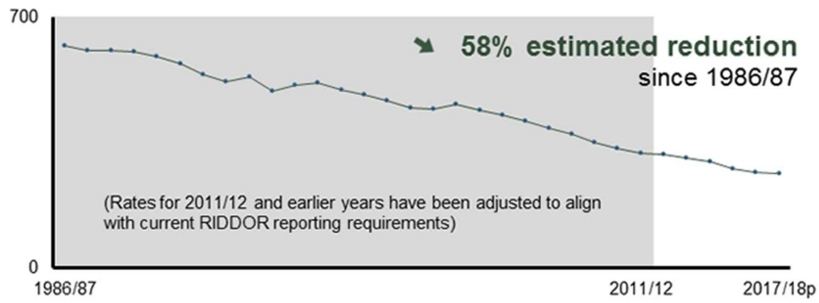
Self-reported non-fatal injuries by length of absence from work



Non-fatal injuries to employees by most common accident kinds



Rate of self-reported workplace non-fatal injury



Rate of employer-reported non-fatal injury

Source Health and Safety Executive 2018f. Available online from:

http://www.hse.gov.uk/statistics/causinj/index.htm

Appendix 2.1: AMSTAR 2: A critical appraisal tool for the systematic reviews that include randomised and non-randomised studies of healthcare interventions, or both.

1. Did the research questions and inclusion criteria for the review include the components of PICO?		
For Yes: ◻ **Population** ◻ **Intervention** ◻ **Comparator group** ◻ **Outcome**	**Optional (recommended)** ◻ **Timeframe for follow-up**	◻ **Yes** ◻ **No**
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?		
For Partial Yes: **The authors state that they had a written protocol or guide that included ALL the following:** ◻ **review question(s)** ◻ **a search strategy** ◻ **inclusion/exclusion criteria** ◻ **a risk of bias assessment**	**For Yes:** **As for partial yes, plus the protocol should be registered and should also have specified:** ◻ **a meta-analysis/synthesis plan, if appropriate, *and*** ◻ **a plan for investigating causes of heterogeneity** ◻ **justification for any deviations from the protocol**	◻ **Yes** ◻ **Partial Yes** ◻ **No**

3. Did the review authors explain their selection of the study designs for inclusion in the review?		
For Yes, the review should satisfy ONE of the following: ☐ ***Explanation for*** **including only RCTs** ☐ OR ***Explanation for*** **including only NRSI** ☐ OR ***Explanation for*** **including both RCTs and NRSI**		☐ **Yes** ☐ **No**
4. Did the review authors use a comprehensive literature search strategy?		
For Partial Yes (all the following): ☐ **searched at least 2 databases (relevant to research question)** ☐ **provided key word and/or search strategy** ☐ **justified publication restrictions (e.g. language)**	**For Yes, should also have (all the following):** ☐ **searched the reference lists / bibliographies of included studies** ☐ **searched trial/study registries** ☐ **included/consulted content experts in the field** ☐ **where relevant, searched for grey literature** ☐ **conducted search within**	☐ **Yes** ☐ **Partial Yes** ☐ **No**

		24 months of completion of the review	
5. Did the review authors perform study selection in duplicate?			
For Yes, either ONE of the following: ☐ at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include ☐ OR two reviewers selected a sample of eligible studies <u>**and**</u> **achieved good agreement (at least 80 percent), with the remainder selected by one reviewer.**			☐ Yes ☐ No

Appendix 4.1: School of Health Sciences School Research Review Group (SRRG) approval letter

ROBERT GORDON UNIVERSITY ABERDEEN

SCHOOL OF HEALTH SCIENCES
Faculty of Health & Social Care
Robert Gordon University
Garthdee Road
Aberdeen
AB10 7QG
United Kingdom
Tel: 01224 263250
Fax: 01224 263290
www.rgu.ac.uk

01.03.2017

Dear Zoi

Re: School of Health Sciences School Research Review Group (SRRG)
Study Title: "Prevention of OIHD in healthcare workers"
Reference Number: SHS/16/18

Thank you for submitting the minor revisions to your application. I can confirm that the revisions are satisfactory and that you now have approval to commence your study as described in the submitted proposal and supporting documentation, subject to two conditions:

1. Gatekeeper approval from NHS Grampian to access the OHS database.
2. Favourable approval from NHS Grampian R&D

Yours Sincerely

Dr Paul Swinton
Convenor, School Research Review Group, School of Health Sciences

Appendix 4.2: NHS Grampian Research and Development letter of permission

Research and Development
Foresterhill House Annexe
Foresterhill
ABERDEEN
AB25 2ZB

NHS Grampian

Miss Zoi Papadatou
NHS Grampian OHS
GO Health Services
Foresterhill Lea
Foresterhill
Aberdeen

Date	11/05/2017
Project No	2017RG001
Enquiries to	Lynn Massie
Extension	53846
Direct Line	01224 553846
Email	grampian.randdpermissions@nhs.net

Dear Miss Papadatou

Management Permission for Non-Commercial Research

STUDY TITLE:	Prevention of Occupational Irritant Hand Dermatitis in Healthcare Workers within NHS Grampian - A mixed methods study
PROTOCOL NO:	V1; July 2016
REC REF:	N/A – RGU 1.3.17
R&D REF:	2017RG001

Thank you very much for sending all relevant documentation. I am pleased to confirm that the project is now registered with the NHS Grampian Research & Development Office. The project now has R & D Management Permission to proceed locally. This is based on the documents received from yourself and the relevant Approvals being in place.

All research with an NHS element is subject to the Research Governance Framework for Health and Community Care (2006, 2nd edition), and as Chief or Principal Investigator you should be fully committed to your responsibilities associated with this.

R&D Permission is granted on condition that:

1) **The R&D Office will be notified and any relevant documents forwarded to us if any of the following occur:**
   - **Any Serious Breaches in Grampian (Please forward to pharmaco@abdn.ac.uk).**
   - **A change of Principal Investigator in Grampian or Chief Investigator.**
   - **Any change to funding or any additional funding**

2) **The R&D Office will be notified when the study ends.**

3) **The Sponsor will notify all amendments to the relevant National Co-ordinating centre. For single centre studies, amendments should be notified to the R&D office directly.**

We hope the project goes well, and if you need any help or advice relating to your R&D Management Permission, please do not hesitate to contact the office.

Yours sincerely

S. Ridge

Susan Ridge
Non-Commercial Manager

cc: Dr Kay Cooper
Dr Markus Steiner
Research Monitor

<u>Sponsor</u>: RGU

Appendix 4.3: Gatekeeper Approval email from the NHS Grampian Head of Occupational Health and Safety

Approval

Approval

Hives Morag (NHS GRAMPIAN)

Sent: 01 December 2015 10:54

To: Papadatou Zoi (NHS GRAMPIAN)

Dear Zoi

I am emailing to confirm that I have authorised for you to access to the OHS database for the purpose of your DPP with Robert Gordon University.

As you are aware you should continue to always work within NHS Grampian information governance policies and guidance, including ensuring that you have completed and updated your Information Governance training.

I wish you every success with your studies which I am sure will add to the evidence base for occupational health and improve practice both within the NHS and in the wider community.

Kind regards
Morag

Morag Hives

Head of Service

GO Health Services *

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Connect with NHS Grampian

https://web.nhs.net/...AABTf%2bWHnrDtQoG9Z77fcYSiACS0NeYyAAAJ&a=Print&AuthResend1908BC2350124b5095AB75012FA405BA[14/01/2016 13:46:16]

Appendix 4.4: Gatekeeper approval letter from the NHS Grampian OHS Nurse Manager

June 2017

Claire Bonnar

Nurse Manager, Occupational Health Service, NHS Grampian.

Dear Claire Bonnar,

I am a part-time Doctorate of Professional Practice (DPP) student in the School of Health Sciences at Robert Gorgon University in Aberdeen. The title of my research study is: 'Prevention of Occupational Irritant Hand Dermatitis in Healthcare workers within NHS Grampian'. I am enclosing a brief outline of the study for you to read and should you require further information with regards to the research study I shall provide you with the full proposal document. I have obtained from the following approvals:

1. Ethics approval : School of Health Sciences, Robert Gordon University.

2. Management approval: NHS Grampian Research and Development and

3. Caldicoltt Approval: Mr Christopher Morrice, NHS Grampian data governance manager

I am writing to kindly ask your permission to access the Occupational Health Service database OPAS, in order to commence Phase I and III of the study proposed below. The purpose of Phase I is to determine the probable prevalence of occupational irritant hand dermatitis at a local level (NHS Grampian) by conducting a review of the Occupational Health Service database. Phase III is aiming to understand the experiences and attitudes of NHS Grampian employees towards hand hygiene and skin care at the workplace. Data obtained through this study will be used in the future to inform and design an intervention that will aim to prevent occupational hand dermatitis.

Thank you for considering my request. Please indicate your approval of this permission by signing the letter where indicated below and emailing it back to me on this secure email address as soon as possible. By signing this letter, you are confirming that you agree for Phase I and III to take place.

Thank you very much.

Sincerely,

Zoi Papadatou Research Degree Student

Email: z.papadatou@rgu.ac.uk

Supervisors: Dr Kay Cooper (Principal Supervisor), Dr Hector Williams (Secord Supervisor), Dr Markus Steiner (External Advisor)

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Claire Bonnar

Appendix 4.5: NHS Grampian Caldicott Approval email

From: MORRICE, Christopher (NHS GRAMPIAN)
Sent: 19 April 2017 14:31
To: PAPADATOU, Zoi (NHS GRAMPIAN); FLUCK, Nicholas (NHS GRAMPIAN)
Subject: RE: Permission for access to NHS G staff database query.

Dear Zoi

Thank you for all the additional information and I am happy to recommend Caldicott Approval for your research study.

Kind Regards

Chris

https://email.nhs.net/owa/ 04/05/2017

Re: Permission for access to NHS G staff da... - PAPADATOU, Zoi (NHS GRAMPI... Page 2 of 14

Chris Morrice
Information Governance Manager
Medical Directorate
NHS Grampian
Rosehill House, ARI, Foresterhill Site, Cornhill Road, Aberdeen, AB25 2ZG
Tel. 01224 551054 Email: christopher.morrice@nhs.net

Appendix 4.6: Table A1 Association between Occupational Groups and Pre-Existing Skin Conditions

Occupational Groups Aggregated		Declarations of pre-existing skin conditions					Total
		Dermatitis/Eczema	Latex Allergy	Psoriasis	Combination	No Declaration	
Doctors & Dentists	Count	59	13	5	11	38	126
	Expected Count	49.3	6.7	6.5	8.9	54.6	126.0
	% within group	46.8%	10.3%	4.0%	8.7%	30.2%	100.0%
	Adjusted Residual	1.9	**2.7**	-.7	.8	**-3.2**	
Nursing & Midwifery	Count	213	28	22	40	269	572
	Expected Count	223.7	30.2	29.6	40.5	248.1	572.0
	% within group	37.2%	4.9%	3.8%	7.0%	47.0%	100.0%
	Adjusted Residual	-1.5	-.7	**-2.4**	-.1	**3.0**	
Other Clinical	Count	58	3	12	8	68	149
	Expected Count	58.3	7.9	7.7	10.5	64.6	149.0
	% within group	38.9%	2.0%	8.1%	5.4%	45.6%	100.0%
	Adjusted Residual	.0	-2.0	1.7	-.9	.6	
Administration & Others	Count	18	3	7	4	11	43
	Expected Count	16.8	2.3	2.2	3.0	18.6	43.0
	% within group	41.9%	7.0%	16.3%	9.3%	25.6%	100.0%
	Adjusted Residual	.4	.5	**3.4**	.6	**-2.4**	
Total	Count	348	47	46	63	386	890
	Expected Count	348.0	47.0	46.0	63.0	386.0	890.0
	% within group	39.1%	5.3%	5.2%	7.1%	43.4%	100.0%

Appendix 4.7: Table A2 Chi-Square Tests - Association between Occupational Groups and Pre-Existing Skin Conditions

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	38.488[a]	12	.000
Likelihood Ratio	35.178	12	.000
Linear-by-Linear Association	.674	1	.412
N of Valid Cases	890		

a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is 2.22.

Appendix 5.1: Excluded studies and reason for their exclusion

Aalto-Korte K, Ackermann L, Henriks-Eckerman ML, Valimaa J, Reinikka-Railo H, Leppanen E, et al. 1,2-Benzisothiazolin-3-One in Disposable Polyvinyl Chloride Gloves for Medical use. Contact Dermat

itis 2007;57(6):365-370.
Reason for exclusion: type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Abramovits W, Granowski P. Innovative management of severe hand dermatitis. Dermatol Clin 2010;28(3):453-465. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Agthe N, Terho K, Kurvinen T, Routamaa M, Peltonen R, Laitinen K, et al. Microbiological efficacy and tolerability of a new, non-alcohol-based hand disinfectant. Infect Control Hosp Epidemiol 2009;30(7):685-690. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Ahmed-Lecheheb D, Cunat L, Hartemann P, Hautemaniere A. Prospective observational study to assess hand skin condition after application of alcohol-based hand rub solutions. Am J Infect Control 2012;40(2):160-164. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Al-Niaimi F, Chiang YZ, Chiang YN, Williams J. Latex allergy: assessment of knowledge, appropriate use of gloves and prevention practice among hospital healthcare workers. Clin Exp Dermatol 2013;38(1):77-80. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Antelmi A, Young E, Svedman C, Zimerson E, Engfeldt M, Foti C, et al. Are gloves sufficiently protective when hairdressers are exposed to permanent hair dyes? An in vivo study. Contact Dermatitis 2015;72(4):229-236. **Reason for exclusion:**

type of population (mixed population, with and without pre-existing skin conditions, intervention and comparison did not match the inclusion criteria.

Apfelbacher CJ. No difference in skin condition between workers exposed and not exposed to glove occlusion in a semiconductor company. Br J Dermatol 2015;172(4):855-856. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.

Apfelbacher CJ, Soder S, Diepgen TL, Weisshaar E. The impact of measures for secondary individual prevention of work-related skin diseases in health care workers: 1-year follow-up study. Contact Dermatitis 2009;60(3):144-149. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.

Arbogast JW, Fendler EJ, Hammond BS, Cartner TJ, Dolan MD, Ali Y, et al. Effectiveness of a hand care regimen with moisturizer in manufacturing facilities where workers are prone to occupational irritant dermatitis. Dermatitis 2004;15(1):10-17. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.

Baumeister T, Weistenhofer W, Drexler H, Kutting B. Prevention of work-related skin diseases: Teledermatology as an alternative approach in occupational screenings. Contact Dermatitis 2009;61(4):224-230. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.

Bearman G, Rosato AE, Duane TM, Elam K, Sanogo K, Haner C, et al. Trial of universal gloving with emollient-impregnated gloves to promote skin health and prevent the transmission of multidrug-resistant organisms in a surgical intensive care unit. Infect Control Hosp Epidemiol 2010;31(5):491-497**. Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) criteria, intervention and comparison did not match the inclusion criteria.

Bregnhøj A, Menne T, Johansen JD, Søsted H. Prevention of hand eczema among Danish hairdressing apprentices: An intervention study. Occup Environ Med 2012;69(5):310-316. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.

Brown T, Rushton L, Williams HC, English JSC. Intervention development in occupational research: An example from the printing industry. Occup Environ Med 2006;63(4):261-266. **Reason for exclusion:** type of population (not wet workers) did not match the inclusion criteria.
Chau JPC, Thompson DR, Twinn S, Lee DT, Pang SW. An evaluation of hospital hand hygiene practice and glove use in Hong Kong. Journal of Clinical Nursing 2011;20(9-10):1319-1328. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Clemmensen KKB, Randbøll I, Ryborg MF, Ebbehøj NE, Agner T. Evidence-based training as primary prevention of hand eczema in a population of hospital cleaning workers. Contact Dermatitis 2015;72(1):47-54. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Davis DD, Harper RA. Using gloves coated with a dermal therapy formula to improve skin condition. AORN J 2005;81(1):157-166. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Dehdasthi A, Khavanin A. Prevention of skin exposure to metal working fluid in a tool manufacturing plant: An intervention approach. Dermatitis 2011;22(5):307. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Dulon M, Pohrt U, Skudlik C, Nienhaus A. Prevention of occupational skin disease: a workplace intervention study in geriatric nurses. Br J Dermatol 2009;161(2):337-344. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Flyvholm M, Mygind K, Sell L, Jensen A, Jepsen KF. A randomised controlled intervention study on prevention of work related skin problems among gut cleaners in swine slaughterhouses. Occup Environ Med 2005;62(9):642-649. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Girard R, Bousquet E, Carre E, Bert C, Coyault C, Coudrais S, et al. Tolerance and acceptability of 14 surgical and hygienic alcohol-based hand rubs. J Hosp

Infect 2006;63(3):281-288. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Held E, Wolff C, Gyntelberg F, Agner T. Prevention of work-related skin problems in student auxiliary nurses. An intervention study. Contact Dermatitis 2001;44:297-303. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Held E, Mygind K, Wolff C, Gyntelberg F, Agner T. Prevention of work related skin problems an intervention study in wet work employees. Occup Environ Med 2002;59(8):556-561. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Hovmand Lysdal S, Johansen JD, Flyvholm MA, Søsted H. Occupational skin exposure and use of protective gloves among hairdressers. Contact Dermatitis 2012;66(s2):48. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Ibler KS. Prevention of Occupational Hand Eczema among Danish Healthcare Workers. Ph.D. Thesis 2012 **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Jungbauer FHW, van der Harst JJ, Groothoff JW, Coenraads PJ. Skin protection in nursing work: promoting the use of gloves and hand alcohol. Contact Dermatitis 2004;51(3):135-140. **Reason for exclusion:** objective of study did not match the review objective.
Korniewicz DM, ElMarsi M. Effect of aloe-vera impregnated gloves on hand hygiene attitudes of health care workers. Medsurg Nursing: Official Journal Of The Academy Of Medical-Surgical Nurses 2007;16(4):247-252. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Kutting B, Baumeister T, Weistenhofer W, Pfahlberg A, Uter W, Drexler H. Effectiveness of skin protection measures in prevention of occupational hand eczema: results of a prospective randomized controlled trial over a follow-up

period of 1 year. Br J Dermatol 2010;162(2):362-370. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Kwok T, Arrandale V, Skotnickigrant S. Repeated mechanical trauma to the hands: The use of antiimpaction gloves for treatment and return to work. Dermatitis 2009;20(5):278-283. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Loffler H, Bruckner T, Diepgen T, Effendy I. Primary prevention in health care employees: a prospective intervention study with a 3-year training period. Contact Dermatitis 2006;54(4):202-209. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Lowney A, Bourke JF. A study of occupational contact dermatitis in the pharmaceutical industry. Br J Dermatol 2011;174(3):654-656. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Lysdal SH, Johansen JD, Flyvholm MA, Søsted H. A quantification of occupational skin exposures and the use of protective gloves among hairdressers in Denmark. Contact Dermatitis 2012;66(6):323-334. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Modak S, Gaonkar TA, Shintre M, Sampath L, Caraos L, Geraldo I. A topical cream containing a zinc gel (allergy guard) as a prophylactic against latex glove-related contact dermatitis. Dermatitis 2005;16(1):22-27. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Mygind K, Sell L, Flyvholm MA, Jepsen KF. High-fat petrolatum-based moisturizers and prevention of work-related skin problems in wet-work occupations. Contact Dermatitis 2006;54(1):35-41. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions, intervention and comparison did not match the inclusion criteria.
Oreskov KW, Sosted H, Johansen JD. Glove use among hairdressers: difficulties in the correct use of gloves among hairdressers and the effect of education.

Contact Dermatitis 2015;72(6):362-366. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Palomaki E, Uitti J, Virtema P, Voutilainen R, Heinijoki L, Savolainen A. Decreasing irritation symptoms by replacing partially coated acoustic glass wool boards with fully coated boards. Scand J Work Environ Health 2008;s4:64-68. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Pedersen LK, Held E, Johansen JD, Agner T. Less skin irritation from alcohol-based disinfectant than from detergent used for hand disinfection. Br J Dermatol 2005;153(6):1142-1146. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Pittet D, Allegranzi B, Sax H, Chraiti MN, Griffiths W, Richet H. Double-blind, randomized, crossover trial of 3 hand rub formulations: Fast-track evaluation of tolerability and acceptability. Infect Control Hosp Epidemiol 2007;28(12):1344-1351. **Reason for exclusion:** objective of study did not match the review objective.
Schliemann S, Kleesz P, Elsner P. Protective creams fail to prevent solvent-induced cumulative skin irritation - results of a randomized double-blind study. Contact Dermatitis 2013;69(6):363-371. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Sell L, Flyvholm MA, Lindhard G, Mygind K. Implementation of an occupational skin disease prevention programme in Danish cheese dairies. Contact Dermatitis 2005;53(3):155-161. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions) did not match the inclusion criteria.
Sharma V, Mahajan VK, Mehta KS, Chauhan PS. Occupational contact dermatitis among construction workers: results of a pilot study. Indian J Dermatol Venereol Leprol 2014;80(2):159-161. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions),
intervention and comparison did not match the inclusion criteria. Skudlik C, Weisshaar E, Scheidt R, Elsner P, Wulfhorst B, Schonfeld M, et al. First results from the multicentre study Rehabilitation of Occupational Skin Diseases - Optimization and Quality Assurance of Inpatient Management (ROQ). Contact

Dermatitis 2012;66(3):140-147. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Skudlik C, Weisshaar E, Scheidt R, Wulfhorst B, Diepgen TL, Elsner P, et al. Multicenter study ''Medical-Occupational Rehabilitation Procedure Skin - Optimizing and quality assurance of inpatient-management (ROQ)''. Journal of the German Society of Dermatology 2009;7(2):122-127. **Reason for exclusion:** objective of study did not match the review objective.
Sosted H. Prevention of hand eczema among hairdressers. Contact Dermatitis 2012;66:25. **Reason for exclusion:** objective of study did not match the review objective.
Spring P. Successful management of hand eczema with the systemic retinoid alitretinoin. Contact Dermatitis 2012;66:75. **Reason for exclusion:** type of population (not wet workers), intervention and comparison did not match the inclusion criteria.
Steengaard SS, Bregnhøj A, Johansen JD. Hand eczema among hairdressing apprentices in Denmark following a nationwide prospective intervention programme: 6-year follow-up. Contact Dermatitis 2016;75(1):32–40.
Reason for exclusion: type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Thomas K, English J. Avoiding hand eczema in healthcare workers. BMJ 2012;345:e8370-e8370. **Reason for exclusion:** objective of study did not match the review objective.
Turner S, McNamee R, Agius R, Wilkinson SM, Carder M, Stocks SJ. Evaluating interventions aimed at reducing occupational exposure to latex and rubber glove allergens. Occup Environ Med 2012;69(12):925-931. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Twedell D, Daniels SM. Maintaining healthy hands. Journal of continuing education in nursing 2010;41(1):14-15. **Reason for exclusion:** objective of study did not match the review objective.
Van der Meer EWC, Boot CRL, Twisk JWR, Coenraads PJ, Jungbauer FHW, van der Gulden JWJ, et al. Hands4U: The effectiveness of a multifaceted implementation strategy on behaviour related to the prevention of hand eczema-a randomised controlled trial among healthcare workers. Occup Environ Med

2014;71(7):492-499. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Van der Meer EWC, Boot CRL, van der Gulden JW, Knol DL, Jungbauer FHW, Coenraads PJ, et al. Hands4U: the effects of a multifaceted implementation strategy on hand eczema prevalence in a healthcare setting. Results of a randomized controlled trial. Contact Dermatitis 2015;72(5):312-324. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Vena GA, Cassano N, Vestita M, Alessandrini G, Calvi C, Carrino N, et al. Clinical evaluation of the efficacy of a barrier cream containing polyvinylpyrrolidone in chronic hand eczema. Eur J Inflamm 2008;6(3):129-134. **Reason for exclusion:** type of population (participants not wet workers), intervention and comparison did not match the inclusion criteria.
Vigan M. Hand dermatitis and therapeutic education in a dermato-allergology unit: The ‘‘School for hands’’. Nouvelles Dermatologiques 2009;28(10 PART 1):445-449. **Reason for exclusion:** objective of study did not match the review objective.
Visscher M, Canning J, Said D, Randy Wickett R, Pattie Bondurant, P. Effect of hand hygiene regimens on skin condition in health care workers. Am J Infect Control 2006;34(10):111-123. **Reason for exclusion:** type of population (mixed population, with and without pre-existing skin conditions), intervention and comparison did not match the inclusion criteria.
Visscher M, Davis J, Wickett R. Effect of topical treatments on irritant hand dermatitis in health care workers. Am J Infect Control 2009;37(10):842.e1-842.e11. **Reason for exclusion:** objective of study did not match the review objective.
Williams C, Wilkinson SM, McShane P, Lewis J, Pennington D, Pierce S, et al. A double-blind, randomized study to assess the effectiveness of different moisturizers in preventing dermatitis induced by hand washing to simulate healthcare use. Br J Dermatol 2010;162(5):1088-1092. **Reason for exclusion:** type of population did not match the inclusion criteria: not wet workers.
Winker R, Salameh B, Stolkovich S, Nikl M, Barth A, Ponocny E, et al. Effectiveness of skin protection creams in the prevention of occupational

dermatitis: Results of a randomized, controlled trial. Int Arch Occup Environ Health 2009;82(5):653-662. **Reason for exclusion:** type of population did not match the inclusion criteria: mixed population – with and
without pre-existing skin conditions.

Appendix 6.1: NOSQ-2002/SHORT questionnaire

NOSQ-2002/SHORT translation master– Nordic Occupational Skin Questionnaire

Instructions to the respondents are written in Italics.

Respondent ID: ____________

G1. Workplace: ______

G2. Are you

a man ☐ 1

a woman 2

G3. Year of birth: 19

G5. What is your present occupation? ______

Since when?*(year)*

G6. What is your major activity at work? ____

Since when?*(year)*

G7. How many hours per week do you work in your main job (on average)?___*(hours/week)*

G8. Do you perform any other paid work regularly?

no ☐ 1

yes ☐ 2

How many hours per week (on average)?_____(*hours/week)*

D1. Have you ever had <u>hand</u>

no ☐ 1

yes ☐ 2

D2. Have you ever had <u>eczema on your wrists or forearms</u> (excluding fronts of elbows)?

no ☐ 1 *(if you also answered* "no" *to question D1 move to question A1)*

yes ☐ 2

D5. When did you last have eczema on your hands, wrists or forearms?

(one answer in each column if applicable)

	Hand eczema eczema	Wrist/Forearm
I have it just now	☐ 3	3 ☐
not just now but within the past 3 months	☐ 4	4 ☐
between 3-12 months ago	☐ 5	5 ☐
more than 12 months ago	☐ 6	6 ☐
In which year was the last time?	____*(year)*	______*(year)*

(make your best estimate)

F1. Have you noticed that contact with certain materials, chemicals or anything else <u>in your work</u> makes your eczema worse? *(one answer in each column if applicable)*

	Hand eczema		Wrist/Forearm eczema	
No	☐	1	☐	1
Yes	☐	2	☐	2
Don't know	☐	0	☐	0

What? ____________ ____________

F2. Have you noticed that contact with certain materials, chemicals or anything else <u>outside your work</u> makes your eczema worse? *(one answer in each column if applicable)*

	Hand eczema		Wrist/Forearm eczema	
No	☐	1	☐	1
Yes	☐	2	☐	2
Don't know	☐	0	☐	0

What? ____________ ____________

F4. Does your eczema improve when you are away from your normal work (for example weekends or longer periods)? *(one answer in each column if applicable)*

	Hand eczema		Wrist/Forearm eczema	
no	☐	1	☐	1
yes, sometimes	☐	2	☐	2
yes, usually	☐	3	☐	3
don't know	☐	0	☐	0

A1. Have you ever had an itchy rash that has been coming and going for at least 6 months, and at some time has affected skin creases? *(by skin creases we mean folds of elbows, behind the knees, fronts of ankles, under buttocks, around the neck, ears, or eyes)*

no ☐ 1

yes ☐ 2

don’t know ☐ 0

Appendix 6.2: Consent form

ROBERT GORDON UNIVERSITY ABERDEEN

Study Number:

Participant Identification Number for this trial:

CONSENT FORM

Title of Project: Prevention of Occupational Irritant Hand Dermatitis in Healthcare Workers within NHS Grampian- A Mixed Methods Study

Name of Researcher: Zoi Papadatou

Please **initial** box

1. I confirm that I have read the information sheet dated.................... (version............) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers. ☐

4. I agree to be contacted by the researcher via telephone for interview. ☐

5. I agree to the use of audio recording. ☐

6. I agree to take part in the above study. ☐

____________________	____________________	____________________
Name of Participant	Date	Signature

Appendix 6.3: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

Title of Project

Prevention of Occupational Irritant Hand Dermatitis in Healthcare Workers within NHS Grampian- A Mixed Methods Study

Research Team

Robert Gordon University (RGU): Zoi Papadatou, Postgraduate Research Student

Dr Kay Cooper

Dr Hector Williams

Dr Markus Steiner

You are being invited to take part in a research study. Before you decide if you wish to take part, it is important to understand why the research is being done and what it would involve. Please take the time to read this information sheet carefully. Please feel free to talk to others about the study if you wish. Ask me if there is anything that is not clear or if you would like more information.

Study aim

Occupational Irritant Hand Dermatitis (OIHD) is a common disease affecting the skin of healthcare workers (HCWs). Occupational-related skin problems can cause long term ill-health and have adverse career implications for HCWs. Furthermore, this can impact adversely on the treatment of patients and also cost to the NHS. This research study is aiming to understand your experiences and attitudes towards hand hygiene and skin care at the workplace. Data obtained through this study will be used in the future to inform and design an intervention that will aim to prevent occupational hand dermatitis.

A researcher (Zoi Papadatou) currently employed by NHS Grampian full-time and studying at Robert Gordon University part-time will carry out the study. This work will form part of a submission towards a Doctorate for Professional Practice (DPP) qualification from Robert Gordon University.

Why have I been chosen?

You have been chosen because you are currently working within NHS Grampian hospitals and are required to do hand hygiene as part of your job.

Do I have to take part?

No. Participation in this research study is entirely voluntary. You are also entitled to opt out at any point of this research study (i.e. If you change your mind or cannot participate due to other commitments). You are still free to withdraw at any time. You decision to withdraw on not to take part in the study will not affect in any way your employment with NHS Grampian.

What exactly will happen to me and what information is to be collected?

If you agree to take part in this research study, you will be sent either a link (via your NHS G e-mail address) to an online questionnaire to fill-in or posted to your home address a paper copy of the questionnaire with a pre-paid envelop to return to the researcher.

You will be asked questions about:

-Your demographic details (e.g. age, gender, education, area of work etc.)

-Your hand hygiene and skin care at the workplace

-Medical questions related to certain materials you come in contact with at work and any skin symptoms you may have or currently experience.

At the end of the questionnaire you will be asked whether you wish to be contacted to take part in a final interview and if so you will be asked to provide your best telephone contact. You may then be invited to take part in an interview with the researcher. The interview can be face to face (at a private room in Aberdeen Royal Infirmary health campus) or via telephone. You will be able to decide the most suitable and convenient way for you. During the interview you will be asked questions about your views/thoughts on hand hygiene, skin care and how to prevent OIHD at work. The interview will be audio recorded with your permission.

How long will these activities last?

10 minutes for filling-in the questionnaire and 45 minutes for taking part in an interview.

Any plans for long-term monitoring/follow-up?

Not for the purposes of this research study.

Will the information I give be kept confidential?

You can be assured that the information given by you is only to be used for the purpose of this study. When you have to provide your personal sensitive details (e.g. your name, date of birth or area of work) your confidentiality will be maintained at all times. You will not be able to be identified in any reports resulting from the study either. Furthermore, taking part in this study and filling in the questionnaire stating your personal opinion will not have any effect on your work or your employment. Only me, my academic supervisors of Robert Gordon University and NHS Grampian Occupational Health Service will have access to the anonymised questionnaires.

What are the possible benefits of taking part?

There are no direct benefits of taking part in this study. Your contribution however, will help to inform the development of an intervention to prevent OIHD amongst HCWs. Moreover, you will help inform both the nursing and medical profession as well as the nursing and medical education in the corresponding Health Board and in Scotland about the proposed aspects that are at present unknown. This may also be useful in improving the future of healthcare workers' quality of clinical practice with regards to skin care and early prevention of OIHD.

What are the possible disadvantages and risks of taking part?

I do not envisage any disadvantages or risks like physical or psychological harm to you from taking part in this study.

What if something goes wrong?

If you have any complaint about the conduct of this study, you should contact Mrs Liz Hancock, Head of School of Health Sciences, Robert Gordon University, 01224 263251 (l.hancock@rgu.ac.uk).

What will happen to the findings of the research study?

The results of this study will be written up as a dissertation for the award of the Doctorate of Professional Practice (DPP) at Robert Gordon University. The data analysis, discussion of the results and findings will provide evidence to inform an intervention to prevent OIHD amongst healthcare workers in the NHS Grampian. The findings may be presented at relevant conferences and/or written up as article for submission to relevant journals for publication. Findings might also be disseminated nationally through the NHS occupational health services and the Society of Occupational Medicine (SOM) and other scientific journals. Your personal sensitive details will be protected at all time and you will not be identified in any publication.

Who has reviewed the study?

The School of Health Sciences (RGU) Research Review Group and the NHS Research and Development department have approved this study.

What do I now?

If you decide to take part in the study, you will be asked to fill-in a brief questionnaire and if you wish, to take part in an interview as described above.

Contacts for further information

Zoi Papadatou, Research Degree Student

Email: z.papadatou@rgu.ac.uk

Academic supervisor: Dr Kay Cooper, Senior Lecturer (Reader)

Email: k.cooper@rgu.ac.uk Tel: 01224 262677

Thank you for taking the time to consider taking part in this research.

Appendix 6.4: Interview Schedule

ROBERT GORDON UNIVERSITY ABERDEEN

Semi-Structured Interview Schedule

Title of Project: Prevention of Occupational Irritant Hand Dermatitis in Healthcare Workers within NHS Grampian- A Mixed Methods Study

Participant Number:	Date: / /	Start time: :

Introduction

Hello, thank you for agreeing to be interviewed for this project. Please can I check that you have read the participant information sheet? If not here is a copy to read before we begin. Please sign the consent form (face to face interviews) / confirm verbally (telephone interviews) if you are happy to go ahead.

The aim of this project is to investigate whether early intervention can prevent OIHD. Early intervention and assessment is crucial to achieve successful, long term outcomes for HCWs with or without pre-existing skin conditions.

Joining the study is entirely up to you and you may withdraw at any point.

If you do not want to answer a specific question, then please let me know. There are no right or wrong answers and I am interested in your personal opinions.

This interview should take approximately 30 to 45 minutes. Are you okay to go ahead?

IF NO: That is fine. When should it be more convenient? Thanks I will meet you on day/date/time at ….. Thank you.	Write the new day/date/time here:

If YES continue: That is great, thank you.

Housekeeping

As you are aware from the participant information sheet and consent form, this conversation will be audio recorded and I would like to emphasise that it is confidential. Are you happy for me to switch on the voice recorder now?

It would be better if you did not use names of hospital staff during this interview. It is ok to refer to 'another nurse', 'doctor', 'a healthcare support worker' etc.

Are you still okay to proceed?

IF NO: That is fine. I will need a little more time to write down notes as we go through the sections and I may ask you to repeat some answers so I ensure I do not miss anything.	**Reminders:** -Take time to write detailed notes -If in doubt ask the interviewee for clarification before you move onto the next section.

If you decide after the interview that you no longer wish to be part of this project, please let me know. My contact details are on the participant information sheet.

Do you have any questions before we begin?

HAND HYGIENE	**Can I start by asking you some questions about your hand hygiene both at work and at home? I am interested in your day to day hand hygiene practices.**
Work How often do you wash your hands with soap and water during a typical shift? *If you perform surgical scrubbing please answer the following questions:	Examples ☐Up to 20 times ☐Between 21 to 50 times ☐Between 51 and 100 times ☐Over 100 times ☐Other If other, please provide details:
*How often do you scrub during a typical shift?	(provide number)
*What is the name of the product(s) you currently use to scrub?	(provide name)
*Do you apply other (e.g. soap and water or hand gel) hand hygiene techniques between scrubs?	☐Yes ☐No If yes, how frequently: (provide number)
What technique do you follow to wash your hands?	☐ Apply soap, wet hands, wash hands, rinse hands, dry hands ☐Wet hands, apply soap, wash hands, dry hands ☐Wet hands, apply soap, wash hands, rinse hands, dry hands
How often do you use the alcohol based hand gel during your shift?	Examples ☐Up to 20 times ☐Between 21 to 50 times ☐Between 51 and 100 times ☐Over 100 times ☐Other If other, please provide details:
What type of gloves do you use during your shift?	Examples ☐Nitrile examination gloves ☐Sterile latex free gloves ☐Both the above ☐Other If other, please provide details:
What is the longest time you wear your gloves for a single task?	(number in minutes)
Home How frequently do you wash your hands when you are at home?	(insert number)
Do you use any alcohol based hand gels when you are at home?	☐Yes ☐No If yes, please provide number of uses:
When you do cleaning tasks (including washing dishes) at home do you wear gloves?	☐Yes ☐No
	☐Yes ☐No If yes, please provide details:

Have you got any hobbies which involve direct contact with chemicals? For example gardening or crafting?	
SKIN CARE	**I am now going to ask you some questions about your skin care at work and at home.**
Work Do you use any hand cream when you are at work? What type of hand cream do you use to moisturise during a typical shift? **Home** Do you use any hand cream when you are at home? What type of hand cream do you use to moisturise at home? Do you use any other products for your skin (e.g. topical steroids, tablets)?	☐Yes ☐No If yes, please provide number of uses: ☐Yes ☐No ☐Yes ☐No If yes, please provide number of uses:
SKIN ISSUES	**I would now like to ask you some questions about any skin issues you might have experienced at work.**
Have you ever developed any symptoms at work affecting the skin on your hands? If you have selected yes, please answer the following questions: What skin issues do you routinely experience in your day to day practice? Why do you think these skin issues occur? How do you handle these skin issues? How soon the skin issues resolve? Do the skin issues re-occur? Why do you think this is happening? Can this be prevented in your opinion, and if so what would you suggest?	☐Yes ☐No
USE OF HEALTH SERVICES OR SELF-HELP APPROACHES FOR ANY SKIN ISSUES	**Now moving to some questions about any health services or self-help approaches you might have used to assist resolve your skin issues.**
Health Personnel Have you received advice and/or support within or out with work from any health personnel with	Examples ☐Line manager ☐Occupational health nurse or doctor

regards to your skin issues? (offer examples if they ask) What did you think of the advice/support you received from the health personnel? **Health Services** Have you consulted any health services with regards to your skin issues? (offer examples if they ask) What did you think of the advice/support you received from the health personnel? **Self-Help Material** Have you used/accessed any self-help material? (offer examples if they ask) What did you think of the advice/support you received from the self-help material? What do you think would best help your skin issues resolve/retreat?	□Practice nurse □GP □Specialist (e.g. Dermatologist) □Other If other, probe for details: □Yes □No Probe for reasons, examples: Do you think it helped? Examples □NHS □Please specify □The occupational health service at my work □My GP If other, please provide details: □Yes □No Probe for explanation/do you think it helped? Examples □Online material (e.g. e-ksf) □Information Leaflets □Books, magazines □Online training If other, please provide details: □Yes □No Probe for explanation/do you think it helped?
THOUGHTS ON SKIN HEALTH AND SKIN CARE AT THE WORKPLACE	**This is the last group of questions I am going to ask you. I would like to hear your thoughts regarding your skin health and skin care at the workplace.**
Is skin health and care at the workplace important to you? Do you see any benefits from looking after your skin at work? What would prevent you from looking after your skin at work? What would help you improve your skin care at work?	Probe for reasons Probe what these are & why Probe what these are & why & how they might be overcome This might be answered with good probing of question above
Well that is all of my questions. Is there anything else you would like to add about skin care that you haven't discussed? You have been very helpful and I appreciate you taking the time to speak to me.	□Yes □No

If you would like to see a copy of the transcript from the interview, please let me know and I will arrange for this to be supplied to you. Would you also be interested in receiving a brief summary of the results? Thank you very much.	Transcript copy: ☐Yes ☐No ☐Yes ☐No Interview concluded at: :

Appendix 6.5: Letter of Invitation

Invitation to take part in a research study (Study Number: SHS/1618)

Dr K Targett
GO Health Services
Foresterhill Lea Building,
Foresterhill Health Campus,
Aberdeen, AB25 2ZY

Dear NHS Grampian staff member

GO Health Services supports research relevant to occupational health in order to develop our services using an evidence based approach. I would like to invite you to take part in a research study being carried out by Zoi Papadatou, Doctoral student at Robert Gordon University, Aberdeen. Please read below a brief description of what you need to do should you wish to take part. Your opinion and experiences are of great importance to our services.

Kind Regards
Dr Katherine Targett
Clinical Lead and Consultant Occupational Physician
FRCPE MFOM
GMC 4033974

I am a doctoral research (DPP) student at Robert Gordon University. The aim of the study is ***to understand your experiences and attitudes towards hand hygiene and skin care at the workplace****. In order to do this, I would like to recruit a small sample of NHS Grampian employees who are currently working within NHS Grampian hospitals and who are required to perform hand hygiene as part of their job.*

I would like to invite you to complete the enclosed survey, which should take you around 10 minutes. If you think you may like to help out please read the enclosed participant information sheet, complete the survey and return to me in the FREEPOST envelope provided. We also aim to conduct interviews over the coming months with a sample of people who complete the survey. Please indicate at the end of the survey if you would be willing to be contacted for this part of the study also. If you would prefer to only complete the survey then there is no need to provide your contact details.

If you would like any further information or to ask any questions, please feel free to contact me on the details below.

Kindest regards,
Zoi Papadatou

Contacts for further information

Zoi Papadatou, Research Degree Student, z.papadatou@rgu.ac.uk

Academic supervisor: Dr Kay Cooper, Senior Lecturer, k.cooper@rgu.ac.uk 01224 262677

Appendix 6.6: NHS workforce by staff group

NHS Scotland staff group as per the Scottish Workforce information Standard System	NHS Grampian staff group as per NHS Grampian Annual Workforce Report
Medical and dental staff	Administrative services
Medical and dental support	Allied health professionals
Nursing and Midwifery	Dental Support
Allied health professionals	Healthcare sciences
Other therapeutic services	Medical and Dental staff
Personal and social care	Medical Support
Healthcare sciences	Other therapeutic
Ambulance services	Personal and social care
Administrative services	Senior managers
Support Services	Support services
Unallocated/not known*	Nursing/Midwifery

*Staff involved in the delivery of core integrated services transferred from Highland council to NHS Highland in June 2012 that have not yet been assimilated to the workforce system and are recorded as unallocated/not known.

Source 1: Information Services Division (ISD) Scotland, 2019b. Available online from:

https://www.isdscotland.org/Health-Topics/Workforce/Publications/data-tables2017.asp?id=2115

Source 2: NHS Grampian, 2016.