Nursing practices cause a notable environmental burden. This qualitative study examined environmental responsibility in nursing in hospitals, its theoretical background, targets, stakeholder roles, and implementation. Five phases of a semi-structured interview guide development process were identified to ensure a rigorous study methodology. The study shows that environmental responsibility in nursing requires supporting structures, including staff training, certain resources, and guidance.
ENVIRONMENTAL RESPONSIBILITY
IN NURSING IN HOSPITALS
Hanna Kallio

ENVIRONMENTAL RESPONSIBILITY IN NURSING IN HOSPITALS

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For my kids –
I wish I could afford you and your offsprings a healthy planet
ABSTRACT

This study focuses on environmental responsibility in nursing in hospitals. The first sub-study was a critical interpretive synthesis that reviewed previous studies on environmental responsibility in nursing (n = 11; years 2002–2012). The second sub-study, a systematic methodological review (n = 10; years 2004–2014), focused on the development of a semi-structured interview guide. In the third sub-study university hospitals’ environmental managers (N = 5) were interviewed and their environmental programmes (N = 5) analysed to describe environmental responsibility in hospital care. The fourth sub-study was a two-round Delphi study that interviewed nurses (n = 35), then scrutinised their agreement on implementing environmental responsibility in nursing.

Based on the review results, previous knowledge on environmental responsibility in nursing has focused on the background framework, arguments, stakeholder roles, targets, and tools. Rigorous development of a semi-structured interview guide comprises five phases, namely identifying the prerequisites for the method, retrieving and using previous knowledge, formulating a preliminary guide, pilot testing, and publishing the final guide. Based on the interviews and document analysis, environmental responsibility in hospital care consisted of the guiding principles, the targets, stakeholder roles, and implementation tools. Implementing environmental responsibility in nursing also requires stakeholder roles, staff training, engagement methods, resources, and guidance.

This study produced new knowledge of environmental responsibility in nursing in hospitals by describing the principles, content and implementation of practices. This study also elaborated the qualitative interview methodology in nursing science. Further research is needed in nurses’ environmental competence and education, staff engagement in environmentally responsible practises, and leaders’ perceptions of promoting environmental responsibility in nursing.

Keywords: Delphi technique, document analysis, environmental responsibility, hospitals, methodological research, nurses, nursing, qualitative research, review, semi-structured interview
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TIIVISTELMÄ


Asiasanat: Delfoi-menetelmä, dokumenttianalyysi, hoitotyö, katsaus, kvalitatiivinen tutkimus, metodologinen tutkimus, sairaalat, sairaanhoitajat, teemahaastattelut, ympäristöväestu
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Jyväskylä, 15 April 2020

Hanna Kallio
LIST OF ORIGINAL PUBLICATIONS

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## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>N</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL</td>
<td>Cumulative Index to Nursing and Allied Health Literature</td>
<td>N</td>
<td>Total amount</td>
</tr>
<tr>
<td>CIS</td>
<td>Critical Interpretive Synthesis</td>
<td>n</td>
<td>Size of the data</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>HCWH</td>
<td>Health Care Without Harm</td>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>ICN</td>
<td>International Council of Nurses</td>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WHO</td>
<td>World Health Organization</td>
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1 INTRODUCTION

The idea of nursing is to advocate for people’s health. However, the practise of nursing significantly burdens the public’s environment and environmental health (Eckelman & Sherman 2018a,b, HCWH 2011). The worldwide workforce of 20.7 million nurses is the largest group of health professionals (WHO 2016), and working close to patients, they act in the core of healthcare consumption. During their daily work, nurses consume care products, pharmaceuticals, chemicals, nutriments and energy; more-over, multilateral support services, such as transportation, kitchen and laundry, are used to run the nursing practise. Providing all of these utilities (Rothausen & Conway 2011) requires the use of power sources and causes greenhouse gases that accelerate climate change (IPCC 2019). The greenhouse gas burden of the health sector is notable compared to many other industries. The United States’ national share is 10 percent (Eckelman & Sherman 2016) and Australia’s is 7–8 percent (Malik et al. 2018). Achieving the aims of the Paris Agreement (UN 2015) and restraining climate change obligate strong activities to cut consumption in all the sectors, including healthcare (CAPE 2019, Charlesworth & Jamieson 2017, HCWH 2016, ICN 2018, Weimann & Patel 2016). Due to its mission to promote health, the health sector (Watts et al. 2018) and nursing profession (Anåker & Elf 2014) have been stated to have a special responsibility for reducing their climate burden and for being role models.

Indeed, nurses play a central role in reducing greenhouse gases and waste in the health sector. Integrating environmental responsibility in nursing, leads to reconsidering nurses’ role in relation to health promotion. Environment has emphasised immediate surrounding factors in the context of hospital care (Meleis 1997). These are both external from hospitals, causing the need for care, and internal, threatening patients’ safety on the one hand and promoting patients’ recovery on the other hand. The nurses’ role focuses on tertiary health promotion and aiding patients to recover from diseases in this traditional perspective. Thus, the nurses’ role in impacting the root causes of environmental harm remains passive. Environmental responsibility posits nurses taking an active role in preventing environmental harm that follows from patient care (Anåker & Elf 2014). Thus, it allows their concrete participation in the primary prevention of environmental diseases. Protecting the environment and, therefore, human health, has been described as being part of the nursing profession’s professional ethics (ICN 2012).

Climate change highlights nurses’ global role in health promotion (Adlong & Dietsch 2015a) and widens environment as a concept from immediate all the way to global surroundings. Nurses’ new role in primary prevention (Charlesworth & Jamieson 2017) thus widens the idea of nursing in hospitals from an individual to a global community paradigm (Grootjans & Newman 2013). The way nurses practise affects the environment all the way to the other side of the world. The aim of preventing climate change pollution alters nurses’ professional ethics towards a
global, future-oriented approach, one that considers the well-being of people geographically distant and unborn.

The World Health Organisation (WHO) highlighted the significance of preserving a healthy environment and natural resources in order to secure human health during the 1980s (WHO 1986). However, environmental responsibility has remained rather unfamiliar in the nursing field (Anåker et al. 2015, Dunphy 2013, 2014), and nurses often seem to consider it distant and disconnected from the duty of curing patients (Lipkin 2012, Peres et al. 2014, Richardson et al. 2014, Soares et al. 2016). Nurses rarely seem to be aware of how their activities have global environmental impacts (Anåker et al. 2015, Griggs et al. 2017, Zimmer & McKinley 2008). The Finnish Ministry of Agriculture and Forestry stated in a recent review that among the different sectors, people working in social and health care were the least aware of the need for climate change prevention in their sector (Mäkinen et al. 2019).

Based on previous literature, material and energy efficiency are important in hospitals, and nurses are a central group of potential professionals who can help to achieve it (Muñoz 2012). However, previous studies rarely provide knowledge of environmental responsibility in nursing, that is, of the elements that comprise it, and how can it be guided and structured in hospitals. Little is known of environmental responsibility in nurses’ everyday practices or what stakeholder groups and tasks are needed. Therefore, qualitative research is needed to identify concepts and contents within the area of interest (Malagon-Maldonado 2014). However, special attention has been paid to the trustworthiness of qualitative research (Bell 2014, Cleary et al. 2014, Gold 2010, Salmon 2013). Thus, to facilitate rigorous empirical findings and increase methodological transparency, a process for developing a semi-structured interview guide was created as part of this study. This study aimed to answer the knowledge gap by describing environmental responsibility and its implementation in nursing in hospitals to enhance the evidence base for practice development and further research.
2 BACKGROUND OF THE STUDY

Nurses' practises have been recognised to yield environmental hazards. The hazards are both direct from the use of environmentally harmful substances (Huffling & Schenk 2014) and indirect from material and energy use (Charlesworth & Jamieson 2017). Environmentally responsible practises aims to protect the environment from these hazards (Dunphy 2014), thereupon ultimately aiming to protect the public's health (WHO 2017). Thus, through a health promotion approach, environmental responsibility belongs to comprehensive nursing practises (Harris et al. 2009, Laustsen 2006, Thornton 2008), similar to other characteristics delineating the nursing profession, such as patient safety, aseptics, or patient mobilisation.

This chapter is based on previous studies, guidelines and other relevant documents in the field of environmental issues in nursing. A systematic search of the research literature was conducted with the question, “What is environmental responsibility in nursing and how to implement it?”. Literature from 2013–2019 was searched from the databases of CINAHL, PubMed and Scopus. The search words nursing OR nurse* OR “health professional*” OR “patient care” OR healthcare OR “health care” OR hospital OR hospitals OR “health system*” were used together with the search words related to environmental responsibility (Appendix 1; Table 5). Altogether, 4224 titles were screened of which 212 abstracts were selected. Among them, 20 papers were included in the review. The studies reviewed used both qualitative and quantitative methods. They originated from different countries, mainly from Australia (n = 5) and the UK (n = 4). (Appendix 2; Table 6).

2.1 THE CONCEPTUAL BASIS OF THE STUDY

2.1.1 Nursing and environment

The concept of environment has an established position in the domain of nursing (Meleis 1997). Jacqueline Fawcett's widely cited (Bender 2018) definition of the nursing metaparadigm, which addresses the phenomena of central interest in the domain, has four main concepts: human beings, environment, health and nursing. According to this definition, environment refers to the physical surroundings in which nursing occurs, significant others, and all the local, regional, national and global cultural, social, political and economic conditions that influence human health. (Fawcett 2005, 5–6).

The environment's dimensions can be perceived from either a patient's or a nurse's perspective regarding patient care. Scrutinised from a patient's perspective, the environment has been determined to have physical, social and symbolic qualities. Physical refer to the concrete constituents; social refers to human interactions; and symbolic refers to the ideational, normative and institutional elements surrounding
qualities of the physical care environment can both threaten and enhance a patient's well-being. They are connected to mobility (Habjanic et al. 2012) and physical activity (Lotvonen et al. 2017), cleanliness (Habjanic et al. 2012) and infections (Ross & Furrows 2014), and, for example privacy (Fridh et al. 2009). The environment’s qualities are, thus, significant with respect to patient safety (Rossi & Edmiston 2012). Therapeutic qualities such as colours (La Torre 2006), art (McCormack & McCanne 2010), nature view (Amankwah et al. 2019) and sounds (Cesario 2009) have been shown to enhance patients' psychosocial recovery (Amankwah et al. 2019, Gross et al. 1998). A natural and seasonal living environment have also been found to set special challenges for individuals’ health and health promotion (Elo 2006).

Scrubinised from a nurse’s perspective, Lake and Friese (2006, p. 2) defined the nurses’ practise environment as "the organizational characteristics of a work setting that facilitate or constrain professional nursing practise". That study’s researchers scrutinised climate- and culture-related factors, such as support gained from their leaders, collegial nurse–physician relations, and staffing adequacy. These kinds of factors are found to be connected to the care outcomes (Lee & Scott 2018, McCormack & McCance 2010), nurses’ job satisfaction (Schmalenberg & Kramer 2008) and work well-being (Huddleston 2014). Nurses’ work environments also include physical components (Cesario 2009), human-made artefacts of the built space, equipment, materials and technology (Institute of Medicine 2004). Considering this study and its target of environmental responsibility, that is, the optimised use of materials and energy, the significance of nurses' physical practise environments becomes central.

2.1.2 Environmental responsibility and human health

Nurses exploit natural resources, products obtained from the ecosystem for their purposes (Kim 2010) as they consume materials and energy. Environmental responsibility refers to endeavours to protect the environment from hazards and, thus, people's environmental health (HCWH 2011). Environmental responsibility foregrounds the significance of a diverse and stable biotic living environment, on which human existence, nutrition, safety and health are dependent (Kim 2010, Waltner-Toews 2004). The sustainable use of natural resources is central to maintaining a productive environment; this refers to using those resources no faster than they can regenerate and generating pollution no faster than the ecosystem, namely seas, forests and soil, can naturally absorb (IPCC 2019). The unsustainable overuse of natural resources destabilises the ecosystem’s balance, leading to species extinction (Pecl et al. 2017) and climate change intensification (IPCC 2019), respectively.

Nurses who realise an environmental responsibility in their work will minimise the environmental harm that follows from patient care practises and, thus, will protect people’s health at primary level (Figure 1). Traditionally, primary prevention, rejecting diseases before they occur, has particularly emphasised public health nurses’ role (Kleffel 2006). The nurses’ role in health promotion in hospitals has
focused on ulterior levels instead, which secondarily highlight preventing the relapse of diseases that have already emerged, and recovery from diseases at the tertiary level (Kleffel 2006, Kris 2015). Environmental responsibility enables nurses in hospitals to participate in concrete primary prevention. Environmental responsibility recognises that environmental hazards are human induced and preventing these hazards is central (Myers 2017). As nurses actively prevent environmental pollution, they will, by implication, protect and promote human environmental health in the first place (Anåker & Elf 2014, Morelli 2011). Environmental responsibility thus comes close to planetary health, which emphasises global health consequences that follow from exceeding the earth’s boundaries. The overuse of natural resources causes environmental harm and, therefore, global health problems; that in turn, increases the use of health and nursing services. (Kurth 2017, Seltenrich 2018.) Nurses’ environmentally responsible behavior lightens the environmental burden on healthcare systems.

Environmental responsibility widening nurses’ role in health promotion

Several different concepts that have been used as synonyms for *environmental responsibility* in the health scientific literature are overlapping (Table 1). For example, *environmental soundness* and other *environment*–derivative concepts such as *carbon friendliness*, and *ecological sustainability* have been used in the context of a staff’s environmentally responsible behaviour. However, *environmental soundness* has also appeared in contexts such as governmental (Topf 2005) and organisational environmental policy (Anderko et al. 2013, Sattler et al. 2012), leadership and decision making (Babu et al. 2018), the field of science (Mulimani 2017), and product quality (Lipkin 2012). *Ecology*–derative concepts refer to the science of ecology, that is, studying interactions between living organisms.
Table 1. Concepts used when environmental responsibility is referred to in health scientific literature

<table>
<thead>
<tr>
<th>Concept</th>
<th>Context used within</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon–</td>
<td>efficient</td>
<td>Nonpolluting healthcare</td>
</tr>
<tr>
<td></td>
<td>friendly</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td>Climate–</td>
<td>friendly</td>
<td>Environmental policy in hospitals</td>
</tr>
<tr>
<td>Environmentally conscious</td>
<td>Staff’s behaviour</td>
<td>Cheng et al. 2011</td>
</tr>
<tr>
<td></td>
<td>positive</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td></td>
<td>preferable</td>
<td>Purchasing policy in healthcare</td>
</tr>
<tr>
<td></td>
<td>responsible</td>
<td>Organisational policy/staff’s behaviour</td>
</tr>
<tr>
<td></td>
<td>safe</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td></td>
<td>sound</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td></td>
<td>sustainable</td>
<td>Nonpolluting healthcare</td>
</tr>
<tr>
<td>Eco–</td>
<td>efficient</td>
<td>Nonpolluting healthcare</td>
</tr>
<tr>
<td></td>
<td>friendly</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td>Ecologically</td>
<td>correct</td>
<td>Waste management in healthcare</td>
</tr>
<tr>
<td></td>
<td>sound</td>
<td>Nonpolluting healthcare</td>
</tr>
<tr>
<td></td>
<td>sustainable</td>
<td>Staff’s behaviour</td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td>Medical treatment practises</td>
</tr>
<tr>
<td>Greening</td>
<td></td>
<td>Organisational policy/staff’s behaviour</td>
</tr>
<tr>
<td>Sustainable</td>
<td></td>
<td>Nonpolluting healthcare</td>
</tr>
</tbody>
</table>

Green in connection with the environmental topic most obviously has its roots in a colour typical considered as healthy, natural vegetation (Table 1). Carbon- and climate-derative concepts refer to the generation of greenhouse gases. Sustainability has been used when referring to environmental responsibility and preventing climate pollution in general (Adlong & Dietsch 2015a, Grose & Richardson 2013). It is derived from the ecological perspective in sustainable development and avoiding the overexploitation of the earth’s carrying capacity (Johnston et al. 2007). According to a concept analysis of Anåker and Elf (2014), sustainability in nursing is a future-oriented, holistic endeavour to protect the environment and, thus, people’s opportunities for good health.

2.2 THE FOCUS AND ORGANISING OF ENVIRONMENTAL RESPONSIBILITY IN NURSING

2.2.1 The focus of responsible material and energy use

The focus of environmental responsibility in nursing is on the effective use of materials and energy. Materials include the variety of care products, pharmaceuticals, nutriments and chemicals. Energy use refers to electricity and water consumption.
Use of reusable and disposable care products

Nurses use care products in different actions as they prepare, assist and conduct patient treatment, such as wound care and catheterisations, take samples and measurements. They also use materials for the purpose of personal protection of both patients and themselves to avoid discharges and microbes. Both washable and disposable products have been used in these activities, but the use of disposable products, such as bandages, basins, textiles, instruments and toiletries, has increased (Ilboston et al. 2013, Vatovec et al. 2013). Thus, considering a sustainable environment, high waste generation in patient care is a visible challenge (Ordway et al. 2018). For example, healthcare in the United States generates 8.4 kilogrammes of waste per bed per day (Minoglou et al. 2017).

Nurses are often able to avoid waste generation. For example, oral medication can be preferred in situations that do not require injections (Brusco & Ogg 2010). Routine opening of care product (Huffling & Schenk 2014) or surgical instrument kits (Laustsen 2010) can be avoided. Also considerations, for example, regarding nurses’ routines in incontinence care, can yield notable waste reductions in patient care (Al-Samarrai et al. 2007). However, based on previous studies, nurses often insufficiently try to avoid waste (Moreschi et al. 2014) and tend to use disposable products unnecessarily (Campion et al. 2015). One example is wearing gloves in situations that do not require use of personal protection equipment, such as mobilising or feeding patients (Richardson et al. 2014, 2017).

Among different specialities, the perioperative setting has been recognised to be a particularly material intensive field of patient care, and great part of medical waste comes from surgical activities (Babu et al. 2018, Ordway et al. 2018, Wormer et al. 2013). For instance, one total knee arthroplasty in the UK causes 13.3 kilogrammes of waste, and generated at the level of one country (Canada), the total knee arthroplasties alone caused 408 tonnes of waste in one year (Stall et al. 2013). Other sectors of healthcare generating the highest waste volumes are the labor-delivery sector (Kwakye et al. 2011) and intensive care (Furukawa et al. 2016a,b, Huffling & Schenk 2014, Pate 2012, Sattler et al. 2012).

Use of disposable products highlights waste sorting and recycling in nursing (Laustsen 2007, McDermott-Levy & Fazzini 2010, Manzi et al. 2014). Compared to using virgin materials in product manufacture, recycled materials burden the environment less (Denison 1996, Riedel 2011). Although many of the products used in patient care could be recycled and waste thus exploited instead of disposal, previous studies in different countries have shown that waste sorting in nurses’ daily practise has often been deficient (Botelho 2012, Johnson et al. 2013, Manzi et al. 2014, Martin et al. 2017, Mosquera et al. 2014, Olaifa et al. 2018, Shinn et al. 2017, Wormer et al. 2013). One recognised reason has been the defunct premises where nurses have worked (Joshi et al. 2015, Nichols & Manzi 2014, Nichols & Mukonoweshuro 2017).
Order and disposal of pharmaceuticals and chemicals

Nursing care includes preparing and providing medication treatments and handling pharmaceutical waste. Handling pharmaceuticals has been shown to be connected to the environmental burden, because manufacturing (HCWH 2018) and disposing (FIP 2015, HCWH 2018) of medicines cause pollution. Nurses can contribute to environmental impacts at both ends. They can make appropriate orders in the units to avoid unnecessary drug expirations, waste and need for manufacture of new drugs. Considering proper disposal and preventing drugs to end up in nature, nurses play key role. For example, if released in drains, sewage purification processes only partly can eliminate pharmaceuticals, some of them not at all (FIP 2015, HCWH 2014a, WHO 2011).

Chemical use in nursing has also been highlighted to prevent environmental hazards from the patient care industry. Some care products contain chemicals harmful to the environment and to health, such as plasticisers (HCWH 2014b), mercury (HCWH 2019c), and fragrances (Brower et al. 2015). The importance of using chemical-free products in pediatric nursing has been highlighted in previous studies, because children are particularly vulnerable to environmental toxins (Brower et al. 2015, Pate 2012). It is also common to use detergents that are toxic to the ecosystem (Babu et al. 2018, HCWH 2019b) in healthcare and nursing-related activities (HCWH 2019a, Sattler et al. 2012).

Nutritional care

Nutritional care is a central part of patient care and nursing. Food production requires high energy use, causing a significant amount of climate gases (Strotmann et al. 2018), but previous studies have paid attention to the environmental impacts of patient nutrition and food waste. Hospital care and elderly services have been found to be two of the most intensive food waste producers. A German study evaluated that up to 145,000 tonnes and up to 65,000 tonnes of food are wasted nationally per year in retirement and nursing homes and in hospitals, respectively. (Kranert et al. 2012.) A corresponding assessment conducted in Portuguese hospitals found that patients left 953 grammes of food uneaten every day, on average. At the country level, this equated to 8,700 tonnes of patient food wasted in Portuguese hospitals annually. Producing this amount of food caused a significant amount of greenhouse gases and required 0,5 percent of the national health budget. (Dias-Ferreira et al. 2015.)

Nurses often can decrease food waste in their units. They can update patient situations on the ward and order food according to the actual need. Practises where patients have opportunity to influence their plate’s contents have decreased food waste (Sonnino & McWilliam 2011). Furthermore, active communication between nurses and kitchen staff has been found to be crucial (Strotmann et al. 2018).
Electricity and water use

Electricity and water use are necessary in nursing. A wide variety of different electric medical devices, computers and lightning are exploited when examining and treating patients, and water is needed to uphold hygiene and sanitary ware. Electricity consumption in hospitals has been found to be directly connected to the number of employees (Conzález Conzález et al. 2018). The nurses’ role in responsible electricity use is emphasised regarding turning idle lights and devices off (Laustsen 2010, Pate 2012) and helping facility staff to optimise building temperatures.

Nurses can optimise water use by avoiding water running and unnecessary linen washing, for example (Huffling & Schenk 2014, Laustsen 2010), and by informing the maintenance unit about leaking water equipment. Idle running of water when scrubbing hands (Jehle et al. 2008, Somner et al. 2008, Wormer et al. 2013) and leaving unused devices and lights powered on has been found to be common in hospitals (Burke & Stowe 2015, MacNeill et al. 2017). Thus, automating nurses’ working environment and adjusting building (Burbee & McDade 2014, García-Sanz-Calcedo 2014) and equipment (Cheng et al. 2011, Furukawa et al. 2016a, Somner et al. 2008) technology have been recommended to decrease energy use in hospitals.

2.2.2 Organising of environmental affairs in hospitals

Organising environmental responsibility in nursing in hospitals occurs at the unit and organisational levels and emphasises nurses’ competencies. Environmental competencies are needed not only to achieve an optimum use of resources but also to facilitate nurses’ role in developing patient care practises. Nurse managers, together with nurses, play a key role in organising and facilitating practises at the the unit level. The role of an environmental support person has also been emphasised. Carrying out environmental responsibility at the organisational level requires administrators to work strategically for a pro-environmental culture, policies for sustainable models, environmental programming, and ensuring environmental expertise in the organisation.

Nurses’ environmental competency and role in daily care

Previous studies have highlighted that nurses must have knowledge not only of sustainable material and energy use but also of the wider connection between human health and environmental hazards, such as climate change (Adlong & Dietsch 2015a, McDermott-Levy et al. 2018). They also need skills to optimise material and energy consumption, such as how to reduce electricity use (Cheng et al. 2011) and safely handle chemicals (Huffling & Schenk 2014). As a specific area of these skills, waste management has been highlighted in several studies, because nurses have been recognised as often improperly sorting waste (Babu et al. 2018, Botelho 2012, Johnson et al. 2013, Manzi et al. 2014, Mostafa et al. 2009). Although, in the study of Olaifa et al. (2018) nurses proved better awareness on recycling compared to other healthcare

Previous studies have highlighted nurses’ central role in the effective use of resources (Kleber 2018, Leffers & Butterfield 2018, Shaner-McRae et al. 2007), as well as their contribution in promoting healthcare institutions’ environmental policy development (Anderko et al. 2013, Kreslake et al. 2018, Pate 2012, Sayre et al. 2010). Nurses’ professional position at the core of patient care practises has been recognised to be optimal for highlighting innovative ideas to develop sustainable operations at the organisational level (Dunbar-Reid & Buiskra 2017, Harris et al. 2009). For example, as the end-users of care products, nurses have been encouraged to call for administrative alignments targeted to buy environmentally preferable purchases (Harris et al. 2009, Huffling & Schenk 2014, Pate 2012), such as chemical-free products (Brower et al. 2015, Sattler et al. 2012) and clean energy (Adlong & Dietsch 2015a). Thus, a need to involve nurses in hospital environmental teams has been highlighted (Jarousse 2012).

Besides promoting environmentally responsible care, nurses’ role has been linked to adding health system’s resilience in climate change. This role has referred to nurses’ participation in preparing the healthcare industry for climate change-related emergency actions (Kurth 2017, Leffers & Butterfield 2018, Sayre et al. 2010) and educating patients about the connection between environmental problems and health (Álvarez-Nieto et al. 2017, Kreslake et al. 2018). Environmentally related patient education has also been linked to the use of pharmaceuticals in nursing. When educating patients to safely use and dispose of pharmaceuticals (Anderko et al. 2013, Becker et al. 2010, Lipkin 2012) and encouraging them to take the initiative in disease prevention, nurses may decrease patients’ need for medication in the first place (Becker et al. 2010).

Facilitating environmentally responsible practises in hospital units

Facilitating environmental responsibility in nursing has been connected in previous literature to the need for common discussions in the functional working environment. Open dialogue regarding environmental topics has been proved to encourage a responsible culture within work communities (Dunbar-Reid & Buiskra 2017). On the one hand, the nurse manager role becomes emphasised in leading staff towards environmentally responsible thinking. On the other hand, the nurse manager’s role can be linked to ensuring nurses’ functional working environment, a factor identified as important in realising environmentally responsible practises (Joshi et al. 2015).
On a unit level, so called environmental support persons have been nominated to facilitate environmentally responsible practises near nurses (Toivonen 2011). Environmental support persons are often nurses with continuing training on environmental affairs. They have been responsible for recognising and developing unit-level practises, such as arranging waste bins and guiding staff to use them. Their role has also included, for example, tailoring organisational instructions according to the unit’s operations (Saarremaa 2018) and informing colleagues of the changes in procedures (Toivonen 2011). Due to their position close to the clinical practise and patient care staff, nurses working as environmental support persons are key professionals in developing environmental responsibility in patient care.

Strategical work in hospitals to promote environmental responsibility

Strategic work at the hospital level has been stated to be the most important factor in achieving employees’ environmentally responsible behavior (Kučukoğlu & Pinar 2015). That refers to organising structures for environmental responsibility in a hospital organisation. Literature highlights hospital administrators’ key role in promoting pro-environmental culture in their organisation, aligning patient care policies, and strategic work referring to environmental programmes.

Pro-environmental culture in an organisation refers to a pattern of assumptions regarding environmental protection, learnt and shared by organisation members and transferred to new employers (Norton et al. 2015). Pro-environmental culture is connected, on the one hand, to employers’ collective sense of responsibility (Dunphy 2014, Ordway et al. 2018) and community (Forsyth et al. 2015, Staddon et al. 2016), and on the other hand, to a sense of permission to behave pro-environmentally (Norton et al. 2015). Administrators shape pro-environmental organisational culture, starting with decision making, policies and strategies (Dunphy 2014) and, more visibly, with mission statements (Kučukoğlu & Pinar 2015), concrete procedures, communication (Norton et al. 2015) and acknowledgements focused at employees (Kučukoğlu & Pinar 2015).

Previous studies have found that administrators play an important role in promoting environmental responsibility by aligning patient-care policies with less polluting care models (Charlesworth & Jamieson 2017). For instance, care models that promote self-care and primary prevention of diseases enhance public well being and also decrease the need for environmentally heavy tertiary care (Charlesworth & Jamieson 2017, Hancock 2011). One care model that protects the environment uses teletechnology. For example, based on a study conducted in the United States, patient care-related traffic emissions were successfully decreased by preferring the use of teletechnologies over patient visits. Over a term of 17 years, this policy yielded the avoidance of 8.6 million kilometres of patients’ driving in one hospital system. (Dullet et al. 2017.)

Aligning environmentally responsible patient care operations includes have a purchasing policy that burdens the environment as little as possible (Ahsan &
Sustainable purchasing in hospitals has often been deficient (Grose & Richardson 2013, Vatovec et al. 2013). One explanation might be that it is a challenging area that requires far-reaching scrutiny (Vatovec et al. 2013). Selection decisions between disposable and reusable products require careful considerations in which the environmental burden of different supply chain phases and the whole life cycle of a product must be evaluated. For example, American studies have indicated that, compared to disposable products, using reusable isolation gowns (Vozzola et al. 2018) and surgical instruments was less burdensome on the environment, although sterilisation methods needed to be optimised too (Unger & Landis 2016, Sherman et al. 2018). Studies from Australia found that instrument sterilisation was disadvantageous because of the local water scarcity and the available power sources (Davis et al. 2018, McGain et al. 2016).

At the hospital level, a central strategic work is the environmental programme (Aallontie 2019), a tool for planning and agreeing on operations (Ryan-Fogarty et al. 2016). Environmental programmes typically include determination of key targets, defining collaborative stakeholders’ tasks, creating means for environmentally responsible services (Aallontie 2019, Ryan-Fogarty et al. 2016) and a plan for the timetable and means for evaluation (Ryan-Fogarty et al. 2016). Addressing the proper indicators, monitoring them, reporting results, and improving operations based on this process have been found to be central in strategic environmental work (Pasqualini Blass et al. 2017). Hospitals’ environmental managers are known to play a leadership role in planning environmental strategy and evaluating its realisation (Ryan-Fogarty et al. 2016). They also are key professionals in directing the transition of individuals and system towards environmentally responsible services (Kurland & Zell 2011), and thus, interact with different hospital departments (Kaplan & Forst 2017).

2.3 GUIDANCE FOR PREVENTING ENVIRONMENTAL HARM IN NURSING

Guidelines and suggestions have been published for the best practises required to prevent environmental harm in nursing and healthcare. Guidance has been provided by nurse coalitions, supranational hospital and health coalitions, such as Health Care Without Harm (HCWH), WHO, and some governments. Current legislation in Finland regulates how hospitals as municipal operators must protect the environment from waste.

Guidance by nurses’ professional documents

The International Council of Nurses (ICN 2018) has highlighted nurses’ responsibility for mitigating and adapting to climate change. ICN has additionally emphasised the need for national nursing associations and governments to act on environmental protection. Some national nursing unions have also advocated
environmental responsibility in nursing. For example, the Association of Perioperative Registered Nurses (AORN 2014) has emphasised high material consumption in perioperative settings and emphasised the need for waste reduction in nursing. The Canadian Nurses Association has highlighted a need for nurses to participate in hospital green teams and also to take organisational leadership in promoting environmentally responsible patient care (CNA 2008). The Alliance of Nurses for Healthy Environments, a professional nursing organisation that addresses environmental health in the United States, has published information and study material for nurses on environmental hazards related to patient care (Leffers et al. 2016), for example, a guide on how to start taking action on climate change prevention in the workplace (AHNE 2019).

Guidance for environmental protection in healthcare

The guidance available for increasing environmental protection in healthcare consists of informative documents provided by different organisations and national legislation. An international nonprofit hospital coalition, Health Care Without Harm (HCWH 2019d), has published guidelines and recommendations focused on both energy and material issues (e.g., HCWH 2011, 2016) in different healthcare fields. Regarding the role of nurses, HCWH has highlighted their ideal professional position and the importance of addressing sustainable initiatives in healthcare organisations (HCWH 2019e). WHO (2017) has also advocated for environmentally responsible healthcare and published a strategic document focused on the key sustainability actions. WHO's document highlights the priority of disease prevention and health promotion in achieving sustainability and presents actions to engage the healthcare workforce in environmental responsibility, emphasising the possibility of governmental guiding mechanisms.

Environmental responsibility in healthcare has been aligned at the national level in some countries. A recent example comes from Australia, where the Victorian Ministry of Health identified that the healthcare sector causes a quarter of the national greenhouse gas burden. The ministry thus called on healthcare providers to participate in climate change prevention and provided administrative outlines to be followed (Victoria State Government 2018). The UK Government has also provided its own guidance to the healthcare industry regarding environmentally preferable purchasing, although, according to Grose and Richardson (2013), that has been sporadically exploited by the National Health Service system.

Legislation in Finland stipulates that municipal operators must protect the environment. As a part of municipal services, public hospitals and health centers are obligated to follow legislation regarding waste disposal and to adequately arrange for waste management in their organisations (Jätelaki 646/2011). Healthcare legislation imposes on municipalities a responsibility to arrange environmental healthcare services (Terveydenhuoltolaki 30.12.2010/1326) and to supervise environmental health (Terveydensuojelulaki 19.8.1994/763). Services must
Additionally be delivered in an environmentally sustainable manner (Kuntalaki 410/2015).

Previous studies have emphasised government's role in environmentally responsible nursing, and that has been linked to the need to promote knowledge and sharing of best practices between patient care institutions about their environmental work (Caniato et al. 2015b, Kim et al. 2018). Governmental opportunities have also been presented regarding both obligatory policies and incentives. Obligatory policies have been recommended to ensure environmental improvements in patient care organisations (Caniato et al. 2015a,b, Charlesworth et al. 2013, Kim et al. 2018, Wang et al. 2016). Governmental incentives have been considered particularly important globally (Al Shatrat et al. 2013, Ashan & Rahman 2017, Peres et al. 2014, Wang et al. 2016).

2.4 EFFECTS OF ENVIRONMENTAL RESPONSIBILITY

Environmental responsibility in nursing that protects the environment from pollution yields both global and more local public health benefits. It can also bring organisational benefits related to work well-being and the economy.

Effects related to environment and public health

First, environmentally responsible nursing practices protect the natural environment from pollution, thereby securing people’s environmental health. Pollution resulting from material and energy consumption in nursing harms the ecosystem and human health. According to Eckelman and Sherman (2018a) healthcare practices in the United States in 2013 caused an additional global loss of 614 000 healthy life years for the public because of the pollution generated. Researchers particularly highlighted consequences resulting from greenhouse gases, such as malnutrition (Eckelman & Sherman 2018a.) Greenhouse gases accelerate climate change, which causes complicated ecological changes that destabilise relationships in the global ecosystem. Environmental degradation exacerbates ecological biodiversity and food production. (IPCC 2019, Pecl et al. 2017, Watts et al. 2018, WWF 2018.) Moreover, strengthened extreme weather events cause physical insecurity for people (CAPE 2019, NASA 2019). Along with climate change, the disease burden has increased because of water scarcity and heat waves (CAPE 2019, Leyva et al. 2017), and the distribution of infectious insects increases (Alkishe et al. 2017, Peck et al. 2017, Watts et al. 2018). Climate change has increased mental health problems, such as post-traumatic stress disorder (Every-Palmer et al. 2016), in addition to increasing somatic health hazards.

Similarly, careful use and disposal of pharmaceuticals (Becker et al. 2010, Furukawa et al. 2016a,b, 2017, Lipkin 2012, Pate 2012) and chemicals (Brower et al. 2015, Huffling & Schenk 2014, McDiarmid 2006, Sattler et al. 2012) in nursing protects both the environment and the public’s health. Improperly disposed of pharmaceuticals can contaminate aquatic environments and soil, aggregate in
nature, disturb living organisms and end up in humans (FIP 2015, HCWH 2018). One consequence of drugs released into nature is the development of antibiotic-resistant microbes (Aditya & Rattan 2014, HCWH 2018). Toxic chemicals used in nursing are also harmful for humans’ environmental health. For example, mercury transfers forward in a food chain, causing neurotoxic harm for people (HCWH 2019c). One chemical still widely used in nursing is polyvinyl chloride (PVC), a type of plastic that is also hazardous for human health in many ways. PVC requires highly advanced burning circumstances, because harmful dioxin emissions are released into the air if it is burnt improperly. Moreover, manufacturing PVC is environmentally harmful because, for example, chlorine is used in it. Both dioxins and chlorine are carcinogens. (HCWH 2019f). PVC also contains substances that disturb people’s hormonal functions, causing damage to sperm quality, for example (HCWH 2014b).

Effects related to work well-being

Environmentally responsible practises that promote physical workplace safety have been recognised. Considerate and careful handling of chemicals (Keward 2013) is important for nurses’ workplace health (MacIsaac et al. 2014, McDiarmid 2006, Mostafa et al. 2009, Sattler et al. 2012). Nurses have shown to carry chemicals used in healthcare in their bodies, many of them harming health (Wilding et al. 2018). For example, detergent use has been connected to occupational lung diseases (Babu et al. 2018, McDiarmid 2006) and chemotherapeutic agents are implicated in fecundity problems (Vatovec et al. 2013). Proper recycling protects people’s occupational health, because improperly sorted hazardous waste, such as needles mix in with regular waste, exposures people who treat wastes (Brusco & Ogg 2010, Vatovec et al. 2013).

Environmental issues have also been connected to mental work well-being. Nurses and other health professionals concerned about environmental practises in private life can feel moral distress if those practises are ignored in the workplace (Pate 2012). These nurses have reported that they have been frustrated, experienced professional ostracism (Dunphy 2014) and been stigmatised among their colleagues (Charlesworth et al. 2013, Terry et al. 2019). For a person concerned with the environment, it can be stressful to see others’ inconsiderate consumption behaviour (Huffling & Schenk 2014). It is topical to acknowledge that organisational environmental responsibility can decrease staff turnover and contribute to a hospital’s reputation as an employer (Benn et al. 2011, Dögl & Holtbrügge 2014, Vogt & Nunes 2014).

Effects related to economy

Arrangements made in hospitals to promote their staffs’ environmentally responsible practises often produce long-term economic benefits (Kaplan et al. 2012). Somner et al. (2008) studied the efficiency of technical investments in relation to a
surgical staff’s water use during scrubbing. They found that changing to a new tap design saved hot water by 5.7 litres per a scrub. Calculated at a level of all the surgeries in the local national health services in the UK, an annual saving of 102,000 euros realised from just heating the water. (Somner et al. 2008.)

Staff-dependent behavior has also yielded economic benefits. A study by Wormer et al. (2013) found that as the staff of a surgery unit began to properly separate hazardous ‘red bag’ waste from regular waste, their practise yielded an avoidance of 53,000 euros of expensive special waste treatment fees in one year (Wormer et al. 2013). McGain et al. (2016) studied its staff’s energy consumption in a sterilising unit and showed that some of the steaming devices were powered on up to 69 percent of the time they were not in use. They found that as the staff switched unnecessary devices off, the hospital annually saved more than a million litres of water and 66 megawatt hours of electricity. That was equivalent to 13 households’ annual electricity consumption. At the same time, the staff prevented 8,700 euros in monetary costs. (McGain et al. 2016). Burke and Stowe (2015) examined its staff’s electricity use in an Irish radiography department and found that just by switching the devices and lights off at the end of the work day, the radiology staff could save up to 4,533 euros in electricity costs in one year.

### 2.5 Qualitative Methods and their Rigour in Producing Knowledge of Environmental Responsibility in Nursing

Previous studies of environmental responsibility in nursing have been studied by quantitative and qualitative methods. Quantitative studies have focused on environmentally responsible nursing practises in operating rooms (Candan Dönmez et al. 2018), medication processes (Furukawa et al. 2016a, b, 2017) and waste management (Dunbar-Reid & Buiskstra 2017, Johnson et al. 2013, Vogt & Nunes 2014). The effects of social marketing interventions have also been examined in relation to a staff’s electricity consumption in hospitals (Manika et al. 2016). Qualitative methods have been used to study health professionals’ competencies (Sari & Camponogara 2014, Schenk et al. 2015) and perceptions of environmental issues (Anäker et al. 2014, Dunphy 2013, 2014, Peres et al. 2014). They have also been used to study waste management (Manzi et al. 2014, Nichols & Manzi 2014, Nichols & Mukonoweshuro 2017, Nichols et al. 2013) and environmentally preferable purchasing practises in patient care (Vatovec et al. 2013).

Interview methods are the most common qualitative data collection methods in health science (DiCicco-Bloom & Crabtree 2006, Malagon-Maldonado 2014), and semi-structured interviews, in particular (Polit & Beck 2010, 341). Semi-structured interview refers to a method with predetermined themes developed based on the central concepts relevant to the study topic. Within the themes, participants can freely report their perceptions (Ästedt-Kurki & Heikkinen 1994). The themes can be
completed with follow-up questions that researchers can use to ask more specific questions and gain more information, if needed (Rubin & Rubin 2005).

Questions of methodological quality are central in qualitative research when considering the feasibility of a study. The study reports for studies that used the semi-structured interview method often lack a description of how the interview guide was developed. Wengraf (2001) has already noted that the semi-structured interview method is wrongly regarded to be an easy method that does not require much planning. Although the semi-structured method allows a researcher to improvise during the interview, referring to probing questions (Rubin & Rubin 2005), one must fully plan the study in advance (Wengraf 2001) to answer the purpose of the study and provide inclusive results (Baumbush 2010, Wengraf 2001). Methodological text-books have been written to provide guidance for semi-structured interviews (e.g., Galletta 2013, Wengraf 2001) and for formulating the interview questions (Rubin & Rubin 2005). Instead, the previous methodological knowledge of the development process of the interview guide is missing. This study created one to improve the rigour of the empirical research and the quality of the findings.

2.6 SUMMARY OF THE BACKGROUND

*Environment* is a central concept guiding the nursing paradigm. Previous studies have particularly emphasised the surrounding factors that impact on patients' (Amankwah et al. 2019) and nurses' well-being (Huddleston 2014). *Environmental responsibility* changes the nurse's role towards becoming an active operator in preventing environmental hazards and, therefore, in protecting the public's environmental health (Anåker & Elf 2014). Previous studies' use of the concepts referring to environmental responsibility in the context of nursing has been heterogeneous. During the last decade, research in this area has increased and nurses' optimal role and competency in optimising consumption have been highlighted. Previous studies have focused on the adequate use of different care products, pharmaceuticals, chemicals, nutriments, electricity and water, and a variety of patient care support services. Nevertheless, more research is needed on how to develop nursing practises on environmental matters.

Based on previous studies, carrying out environmental responsibility in nursing has proved to have positive influences on the natural environment (Laustsen 2006); it has also improved employees' work well-being (Dunphy 2014) and decreased organisational costs (Kaplan et al. 2012). Revised practises have reduced greenhouse gas generation (McGain et al. 2016), and proper chemical and waste management reduce occupational diseases and injuries (McDiarmid 2006). Moreover, environmental responsibility has been connected to mental well-being and has been shown to prevent nurses' work-related stress (Huffling & Schenk 2014). Studies have shown that economic savings from environmentally responsible practises were due to the optimised use of resources (Burke & Stowe 2015, Somner et al. 2008).
Avoidance of idle material and energy use reflects directly on financial costs, and over the long term, well-considered investments allow a reduced use of electricity, water or materials over time.

Environmental responsibility in nursing has been found to require development at the hospital level. Hospital administrators can promote a pro-environmental culture (Dunphy 2014), by aligning policies favouring nonpolluting services and purchasing practises (Charlesworth & Jamiesion 2017) with strategic work on environmental responsibility (Ryan-Fogarty et al. 2016). On a unit level, the nurse manager’s role is connected to facilitating practises and engaging nurses (Joshi et al. 2015), and environmental support person’s role to arranging daily practises and providing peer support (Toivonen 2011). Little is known of roles in unit-level. The guidance given for environmental responsibility in nursing mainly consisted of statements and guidelines from nurse and hospital coalitions. Previous research has indicated that governmental guidance with informative (Kim et al. 2018) and regulative mechanisms (Charlesworth et al. 2013), and incentives (Ashan & Rahman 2017) are beneficial for developing and maintaining environmental practises.

According to previous studies, optimising material and energy use is a central part of nursing. However, little is known about healthcare professionals’ perceptions of it and of how to implement environmental responsibility in everyday care. The semi-structured interview method is commonly used in health scientific studies and can provide valuable knowledge of the sparsely studied topic of environmental responsibility in nursing. However, scientific methodological guidelines for the development of a semi-structured interview guide have been lacking.
3 AIMS OF THE STUDY

This study focuses on environmental responsibility in nursing in hospitals. The aim was to describe the arguments and targets, stakeholders and tools for implementing environmental responsibility. The ultimate aim of the study was to provide knowledge for developing structures for environmental responsibility in hospitals and the contents for nursing education.

The specific objectives of this study were:

- To provide a synthesis of studies on environmental issues in nursing (sub-study I)
- To produce a framework for the development of a qualitative semi-structured interview guide (sub-study II)
- To identify the key elements of environmental responsibility in hospital care (sub-study III)
- To explore nurses’ perspectives of implementation tools for environmental responsibility in nursing (sub-study IV)
4 METHODS

This study consisted of four sub-studies (Figure 2). Literature reviews were used to produce theoretical knowledge; qualitative methods were used to produce empirical knowledge.

The first sub-study used the Critical Interpretive Synthesis (CIS) method (Dixon-Woods et al. 2006), which synthesised previous research knowledge on the topic of environmental responsibility in nursing. Review was needed for the basis of empirical sub-studies to determine what had been published on the study topic and gain an understanding of the topic to be studied (Grove et al. 2013). The second sub-study was a systematic methodological review (Campbell et al. 2014), which produced a framework for the development of a qualitative semi-structured interview guide. This review was needed to enhance the trustworthiness of the qualitative research methodology to be used in empirically examining environmental responsibility in nursing. The need for this review emerged, because the research literature did not cover the development process for a semi-structured interview guide.

The third and fourth sub-studies used qualitative empirical methods that enabled exploring the sparsely studied and multidimensional topic of environmental responsibility in the context of nursing in hospitals (Grove et al. 2013). Finnish university hospitals (N = 5) provided the research environment for the qualitative studies. The third sub-study aimed to identify the key elements of environmental responsibility in hospital care, that includes the organisational structures for environmental responsibility in nursing. Its method was key informant interviews, as they enabled to effectively obtain relevant and rich data provided by experienced informants in a central position regarding the research topic (Marshall 1996). Document analysis was also used to complement the data (Bowen 2009).

The fourth sub-study explored nurses’ perspectives on the tools for implementing environmental responsibility in nursing. The Delphi method was used, because it allowed the creation of nurses’ opinion consensus on the topic (Clayton 1997). In the Delphi, the semi-structured interview technique was exploited to gain a description of the participants’ views within the research interest (Baumbusch 2010). The results of the third sub-study were exploited to develop an interview guide for the data collection.
4.1 CRITICAL INTERPRETIVE SYNTHESIS

This sub-study’s aim was to provide a synthesis of studies on environmental issues in nursing. The research question was, “What does environmentally responsible nursing consist of?” Based on a tentative search, research covering the topic was recognised as sparse, fragmented and largely carried out with theoretical methods. Thus, the critical interpretive synthesis (CIS) was used, because it allowed to integrate findings from studies conducted with diverse methods. The CIS methods allows studies with different quality levels to be included, because utilising critical subject information arising from the studies exceeds scrutiny of methodological standards in them. Moreover, the CIS method allowed the researchers’ own interpretation to be incorporated into the wholeness. (Dixon-Woods et al. 2006.)

Review process and the data. The CIS proceeded through six phases (Dixon-Woods et al. 2006). After a research question was formulated the data was searched using the electronic databases of CINAHL, PubMed and Science Direct. The searches were limited to papers published between 2002–2012, and the search terms included concepts describing environmental responsibility combined with healthcare, hospital or nursing. They found of 828 papers. Next, papers were selected based on
predefined inclusion criteria, namely that the papers had to answer the research question. First the titles were screened, then the abstracts and finally, the full-texts, to select the papers. Eleven papers were eventually included in the analysis. The relevant papers that did not particularly focus on nursing but on healthcare more broadly were also included in the review due to the scarcity of studies.

After selecting the papers, their quality was appraised based on the checklist by Dixon-Woods et al. (2006). The papers were both theoretical and empirical studies, and both qualitative and quantitative methods were used in the empirical studies. The studies had mainly been conducted in the United States. During the analysis phase, the expressions were extracted that answered the research question from the data. The final phase of the CIS process was to synthesise the data. The studies were scrutinised in relation to each other and their contents abstracted into wholeness. (Dixon-Woods et al. 2006.)

4.2 SYSTEMATIC METHODOLOGICAL REVIEW

This sub-study’s aim was to produce a framework to develop a qualitative semi-structured interview guide. Its ultimate aim was to strengthen the trustworthiness of the qualitative research. Its research question was, “What are the phases of the development of a qualitative semi-structured interview guide?” The study was based on research literature and conducted using the systematic methodological review method (Campbell et al. 2014).

The review process and data. After formulating a research question, the data was searched using the electronic databases of CINAHL, PubMed, Scopus and Web of Science. The searches were limited to papers published in 2004–2014 and written in English. The search terms were formulated based on the synonyms for the phrase “semi-structured interview.” Number of 2,703 papers was found. After that, the papers were selected based on a pre-defined inclusion criterion. First, papers were selected that mentioned semi-structured interview guide in a title or abstract. The selection produced 21 full texts. Second, based on the full texts, only the papers that particularly focused on semi-structured interview guide development were selected (n = 10).

The selected papers used theoretical methods based on literature. They were published from 1994–2015, in the journals focused on the health sciences and research methods. Content analysis (Elo & Kyngäs 2008) was used to analyse the data. First, the content regarding development of the semi-structured interview method was identified, after which they were grouped and named inductively; sub-categories were formed based on groups’ similarities and differences. Sub-categories were grouped again into generic categories and grouped further into five main categories.
4.3 KEY INFORMANT INTERVIEWS AND DOCUMENT ANALYSIS

This sub-study’s aim was to identify the key elements of environmental responsibility in hospital care. The research question was, “What are the key elements of environmental responsibility in hospital care and who are the stakeholders involved in it?” This was a qualitative study with key informant interviews (Marshall 1996) and a document analysis (Bowen 2009).

Participants and the document data. The participants comprised a full sample of university hospitals’ environmental managers (N = 5). They were experts in coordinating sustainable endeavours in their organisations and worked in their hospitals’ technical departments. The full sample of those hospitals’ environmental programmes was also analysed (N = 5; 86 of pages in total). Environmental programmes were requested and received from the participants or their secretaries by email. The programmes were public documents, so organisational permission was not needed.

Participant recruitment and interviews. The key informants were interviewed by semi-structured interviews focused on the themes that were relevant considering the topic but that allowed the participants to freely reveal their perceptions (Barriball & While 1994). The interview guide was based on previous knowledge and included four main themes with follow-up questions. The interview guide was pre-tested with one technical manager answering for environmental affairs in a central hospital. Based on the pre-test, the guide (Kallio 2013; Appendix 2) was found comprehensive and logical. The individual interview technique was used in the research interviews because of long geographical distances between the participants. After receiving organisational approval, hospitals’ help desks were contacted to identify environmental managers and their contact information to recruit them into the study. All the managers expressed their willingness to participate. The interviews (n = 5) were conducted between January and March 2013 (Kallio 2013) in the participants’ hospital offices. The duration of one interview was 90 minutes on average (7.5 hours in total), and they were audio-recorded for the analysis.

Analysis. The data were analysed in two stages using the content analysis method (Elo & Kyngäs 2008). The interview data was inductively analysed in the first stage. First, the data were transcribed verbatim, yielding 104.5 of pages (Word, Times New Roman size 12, line spacing 1.5, normal margins). Then expressions describing environmental responsibility were extracted from the texts, reduced and grouped based on their similarities and differences. Again, these groups were abstracted into sub-categories. The 51 sub-categories were named and grouped into 16 generic categories and further into four main categories. The document data were deductively-inductively analysed in the second stage, using the coding tree formed in the first analysis phase. Expressions were extracted according to the sub-categories, and the data were screened to ensure whether new ones would emerge (Elo & Kyngäs 2008).
4.4 DELPHI-STUDY

This sub-study’s aim was to explore nurses’ perspectives on implementing environmental responsibility in nursing. A modified Delphi method with two rounds (McKenna 1994) was used: the data were collected by interviews in the first round and by questionnaire in the second round (Boulkedid et al. 2011, Hasson et al. 2000). The participants were nurses from university hospitals’ (N = 5) material-intensive patient care units. Nurses working as environmental support people were primarily invited to participate. Nurses from the hospitals’ hygiene departments were also included, since their role was emphasised in sub-study III’s findings.

First round of the Delphi

Previous knowledge of nurses’ perspectives regarding the study topic was sparse, so the first round of data was collected using semi-structured interviews (Kallio et al. 2016) and exploiting the interplay between the participants in small groups (Doody et al. 2013). The interview guide was built according to the five phases developed by Kallio et al. (2016). After identifying the semi-structured method suitable for the study’s purpose, research knowledge gained in sub-studies I and III and other previous literature on environmental responsibility in nursing (e.g., Anåker et al. 2015, Huffling & Schenk 2014, Ryan-Fogarty et al. 2016) was used to build an inclusive interview guide. Themes that had arisen from earlier studies were formulated into a structured, interrogative form. An internal testing technique was used to pilot test the guide. The participants in the internal testing were master students in nursing science (n = 4), all of whom were female and degreed as registered nurses with clinical experience in environmental work in nursing. Based on the internal test, the content and wording of the pilot test preliminary guide was modified to make the final guide (Sub-study IV manuscript: Table 2) understandable and logical. (Kallio et al. 2016.)

After receiving organisational approval, nurse managers in the university hospitals were contacted to inform them about the study and recruit environmental support persons or other nurses who were interested of the topic. According to the procedures in one participating hospital, the researcher was asked to contact a contact person in the hospital, who then recruited study participants. The recruited persons who were willing to participate contacted the researcher by email or phone. The interviews were arranged between January and February 2019. Altogether 10 interviews, two in each hospital, were conducted, with 2–5 people in the groups. One interview took 78 minutes on average (12 hours 59 minutes in total), and interviews were audio-recorded. A total of 35 nursing staff members participated in the first round of the Delphi. The interview began with the participants completing a demographic information form that asked for work characteristics, age and gender. Also their email addresses were asked for the purpose of the second round data collection. Among the participants, 71 percent (n = 25) worked as an environmental
support person in their units. A share of 43 percent (n = 15) had participated in the voluntary environmental training at hospitals. Participants worked in surgical (n = 7) and other operative units (n = 12), internal medicine (n = 4) and other conservative units (n = 5), and other units (n = 7), such as infection control. Participants’ ages were between 30–62 years, 47 years on average. Among them, 89 percent (n = 31) were women and 11 percent (n = 4) of men.

The content analysis method (Elo & Kyngäs 2008) was used, which started by transcribing the recordings verbatim, yielding to 202,5 pages of text (Word, Times New Roman size 12, line spacing 1,5, normal margins). More specifically, the deductive-inductive content analysis method was used to analyse the data, focusing only on the manifest content. At first, the data were analysed based on a deductive framework that was formulated based on knowledge produced during sub-studies I and III. The analysis focused on environmentally responsible practises in nursing derived from the targets of environmental responsibility, stakeholder roles, and implementation tools. Expressions referring to these themes were extracted from the data; these were then simplified and grouped based on their similarities and differences, first into sub-categories and then further into generic categories. The data were reread and analysed inductively after the deductive analysis to derive possible new categories and themes from the data. (Elo & Kyngäs 2008.) This phase produced new sub- and generic categories to complete the existing ones, plus a new main category, resources needed for the realisation of environmental responsibility.

Second round of the Delphi

The second round’s aim was to develop the nurses’ opinion consensus on the topic. The participants (n = 35) were the same ones enrolled in the first round. The data were collected using a questionnaire whose statements were based on the first round’s results (Clayton 1997, Keeney et al. 2011). The statements focused on environmentally responsible practises, and stakeholder roles, and more specifically an environmental support person’s role. The statements also focused on implementation tools, namely the contents of the staff training, tools to engage the staff, and the resources and guidance that are needed for environmental responsibility in nursing. The participants were asked to evaluate their agreement with the statements using a Likert scale that ranged from “Totally agree” to “Totally disagree”. The participants also could answer “Can’t say”. Every item offered the option to specify the answer with free text. Participants were also asked to rate the most important items of the statements. (Table 2.)
Table 2. An example of the statements (the theme covering staff’s competency)

<table>
<thead>
<tr>
<th>Hospital staff' in-service training needs to include information of</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Environmentally responsible use of material, electricity and water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Causes and consequences of climate change</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>• Impacts of chemicals and pharmaceuticals on environment/environmental health</td>
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<tr>
<td>• Technical waste management processes, for example in burning plants</td>
<td></td>
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</tr>
<tr>
<td>• Collaboration between the different stakeholder groups for environmental responsibility in a hospital</td>
<td></td>
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<tr>
<td>• Hospital’s environmental programme</td>
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</tbody>
</table>

In addition, select the three most important topics of staff’s environmental training

| • Environmentally responsible use of material, electricity and water | √ |   |   |   |   |
| • Causes and consequences of climate change                        |   |   |   |   |   |
| • Chemicals’ and pharmaceuticals’ impacts on environment and environmental health |   |   |   |   |   |
| • Technical waste management processes for example in burning plants |   |   |   |   |   |
| • Collaboration between the different stakeholder groups in realising environmental responsibility in a hospital |   |   |   |   |   |
| • Hospital’s environmental programme                               |   |   |   |   |   |
| • Some other topic, what? (space for free text)                    |   |   |   |   |   |

4 = Totally agree, 3 = Partly agree, 2 = Partly disagree, 1 = Totally disagree, 0 = Can’t say

The preliminary test of a questionnaire was conducted by an evaluation panel (Hasson 2000) consisting of registered nurses in clinical practise (n = 4) and post doc and senior researchers (n = 3). The nurses were experienced with the topic of environmental affairs in nursing and the researchers were experts in methodology. The panelists were asked to evaluate the statements’ understandability and logic and provide other relevant comments (Grove et al. 2013). Based on their feedback, revisions were performed regarding the content, structure and wording of the questionnaire.

An e-mail invitation was sent in May 2019 to the participants with a link to the questionnaire. They had four weeks time to complete the questionnaire. The response rate in the second round of the Delphi was 77 percent (n = 27).

For the data analysis, an agreement level of 75 percent was set that included responses of both “Partly agree” and “Agree” (Clayton 1997). The data were analysed with descriptive statistical methods (Keeney et al. 2011). The frequencies and percentages of the agreement values were calculated and the participants’ open answers were screened and described if they provided explanations for their responses. Regarding the items focused on the targets of environmental responsibility in nursing, participants’ rating of importance and their given open responses were contradictory; thus, that question will not be reported for that part of the second round results.
5 RESULTS

5.1 ELEMENTS OF ENVIRONMENTAL RESPONSIBILITY IN NURSING (SUB-STUDY I)

Environmental responsibility in nursing consists of frameworks, arguments, stakeholder roles, targets, and tools. Ecology and environmental health created two inseparable frameworks for environmental responsibility in nursing. Ecology referred to the need to maintain ecosystem balance and prevent nurses from contributing to global warming. Environmental health referred to the need to protect the public’s environmental health through nurses’ responsible practices. Arguments for advancing environmentally responsible nursing were about ethics, health promotion, nursing ecological theory, economy, and legislation and regulations.

Environmental responsibility in nursing required the roles of the stakeholders, who include nursing staff, administrators, patients and relatives. The nursing staff’s role was to create and realise environmentally responsible practices and participate in politics and decision making. Administrators refers to a hospital’s top management, whose role was to implement an environmental programme in their organisation, make decisions, provide resources and establish policies, supervise and evaluate operations, and provide managerial support. Patients’ and relatives’ roles were highlighted regarding waste sorting.

The target of environmental responsibility in nursing was responsible consumption of energy and different materials. Energy included both electricity and water use. Nurses’ opportunities to reduce consumption were recognised in switching off unused lights and devices, and avoiding unnecessary linen wash and running water. Material consumption was related to sustainable purchasing, adequate everyday use of products, and proper waste management. There were several tools which were found to be beneficial in promoting environmental responsibility in nursing, namely staff’s education, clear and updated protocols and guidelines, planning and organising practices, organisational collaboration, and continuous research.

5.2 FRAMEWORK FOR DEVELOPING A SEMI-STRUCTURED INTERVIEW GUIDE (SUB-STUDY II)

Based on the results, the research determined that the semi-structured interview guide can be developed in five phases. The first phase of the development process was to identify the prerequisites for using semi-structured interviews. It referred to assessing suitability of the data collection method in relation to the research topic and question(s) and to any earlier research knowledge on the topic. The second phase was to retrieve and use the previous knowledge; this included gaining a comprehensive understanding of the study topic by using a systematic literature
search and critical appraisal of the earlier studies. This phase could also exploit the empirical knowledge, such as expert interviews. The third phase was to formulate a preliminary semi-structured guide using previous knowledge to formulate a structured, logical and coherent interview guide. A semi-structured guide consisted of the main and follow-up questions aiming at gaining the richest possible data.

The fourth phase of the development process was to pilot test the interview guide to confirm its coverage and understandability. The pilot test could be conducted using three optional or complementary methods: internal testing, expert assessment and field testing. When assessing the interview guide in general, such as possible leading questions, internal testing was recommended when referring to collaboration with other investigators. When performing internal testing, researchers could also assume the participant role themselves to gain an understanding of an interviewee’s position regarding the guide. Expert assessment as a method of pilot test was recommended when the emphasis was on assessing the appropriateness and comprehensiveness of an interview guide's content. Field testing was suitable when the intelligibility and implementation of the interview guide needed to be assessed. This referred to testing the guide with people similar to the participants in an actual research interview.

The fifth phase of the semi-structured interview guide development process was to present the final guide in a study paper. This increases the study’s transparency on its methodology and trustworthiness, meaning that other researchers could also use the interview guide.

5.3 ENVIRONMENTAL RESPONSIBILITY IN HOSPITAL CARE (SUB-STUDY III)

The results show that the aim of environmental responsibility in hospital care is to avoid unnecessary emissions. The four key elements of environmental responsibility in hospital care are the guiding principles, targets, stakeholder roles, and implementation tools.

The guiding principles for environmental responsibility in hospital care were authoritative tutelage and ethical values. Authoritative tutelage referred to governmental policies all the way to EU directives and recommendations. It also referred to waste management orders gained from different organisations that participate in hospital waste management. Ethical values referred to how individuals and organisations balance between right and wrong, including, for example, role modeling and good care. Energy and material consumption are the targets of environmental responsibility that were emphasised. Material consumption included considerations of sustainable purchasing and the means to promote that, the means to minimise waste generation, and the means to promote waste recycling. Environmental managers and their programmes also handled protecting the environment from risky materials, namely harmful chemicals and pharmaceuticals. Regarding energy consumption, environmental managers and their programmes
particularly highlighted exploiting modern technology and construction. The significance of traffic was also identified. According to environmental managers and their programmes, hospital-related traffic caused a notable environmental burden and were related to both material and passenger traffic. Several means to inhibit traffic burden were highlighted. For example, equipment selection and promotion of public transport had been exploited.

Environmental responsibility in hospital care requires several different stakeholder roles. The administrator role was considered essential for strategic work and decision making. Their role was to support environmental responsibility widely and create a pro-environmental culture in their organisation. The environmental manager role was to coordinate environmental affairs in their organisation and successfully promote an environmental programme. They united the administration and employees by working in between them. The nurse manager role in hospital units was emphasised in the process guidance to ensure environmental responsibility and promote responsible culture in the units. Their role was to ensure that a named environmental support person was in their units. An environmental support person's role was considered important for promoting implementation of responsible initiatives. These people, often nurses, were selected from among the work communities; they were trained in environmental responsibility and how to promote realisation of responsible practises. Promotion referred to peer support, arranging functional facilities, creating and updating instructions, and informing administration and staff about changes and needs. Staff needed to use resources effectively and were encouraged to avoid private motoring. Environmental managers found staff engagement highly challenging. The patient's role in environmental responsibility was emphasised by encouraging them to avoid private motoring.

According to the environmental managers and programmes, the key tools for implementing environmental responsibility in hospital care were multiprofessional collaboration, staff education and motivation, and continuous practise development. Multiprofessional collaboration included both intra-organisational connections and networks that extended outside the hospitals. One important collaboration should occur between environmental and hygiene professionals in order to secure both ecological sustainability and aseptics. Staff education included both improving their general awareness and providing focused training. Degreed student education was also considered important. Types of effective communication were discussed, and environmental managers considered it beneficial to provide justifiable, easy and visual information for the staff. Staff motivation was central in implementing environmental initiatives in hospital care and ensuring continuity. Here, a low threshold for responsible practises was essential. According to environmental managers, the environmental topic needed to be discussed positively and staff should be offered incentives and rewarded for their progress. Continuous development of practises referred to exploitation of the aims, eligible indicators, progress assessment and intervention allocation.
5.4 IMPLEMENTATION OF ENVIRONMENTAL RESPONSIBILITY IN NURSING (SUB-STUDY IV)

First round results

Environmentally responsible practices in nursing focused on optimised material use, which was achieved by sustainable purchasing, considerate use of products, and utilising waste by recycling it. The other focus was optimised energy use, referring to minimised electricity and water use and decreased traffic. (Table 3.)

The results indicated opportunities for both individual nurses and administration to ensure optimal material and energy use. Sustainable, cooperative purchasing referred to buying durable and sustainable products, electricity and suppliers, and promoting uniform and joint purchases in hospitals. Thus, it emphasised administrators’ decision making regarding optimal material use in nursing. Considerate material use instead covered individual nurses’ opportunities to prevent waste and chemical emissions in clinical practice. Both the nurses’ and the organisation’s role emerged in relation to utilising waste by recycling it to avoid the need for new raw materials. Considering optimised energy consumption, minimising idle energy use emphasised nurses’ practices and the significance of their routines, for example, changing textiles and using electric devices. Transportation reduction highlighted administrative alignments; nurses’ and patients’ opportunities to decrease traffic use also were brought up. (Table 3.)
Table 3. Results covering nurses’ perspectives on environmentally responsible practises in nursing

<table>
<thead>
<tr>
<th>Sub-categories</th>
<th>Generic categories</th>
<th>Main-themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing durable products</td>
<td>Sustainable, cooperative purchasing</td>
<td></td>
</tr>
<tr>
<td>Favouring sustainable electricity, suppliers and support services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joining device purchases between hospital units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making uniform purchases in organisation to enable compatibility of devices and accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making updated storage, drug and food orders in the units</td>
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<td></td>
</tr>
<tr>
<td>Selecting adequately between disposable and reusable products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using oldest products first</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoiding opening product packages and kits just for a case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only taking those products in the patient rooms that truly are needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using products (cloves, diapers, kidney basins, bed covers, etc.) and printing only when truly needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storing and preserving products correctly to prevent contamination</td>
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<td></td>
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<tr>
<td>Dosing detergent correctly</td>
<td></td>
<td></td>
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<tr>
<td>Employing unused products (for example from the kits) for other purposes instead of throwing away</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donating seldom used products to other units to prevent them expiring</td>
<td></td>
<td></td>
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<tr>
<td>Sorting and recycling waste</td>
<td></td>
<td></td>
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<tr>
<td>Selling extra food in the restaurants with discount</td>
<td></td>
<td></td>
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<tr>
<td>Arranging furniture flea market in hospitals for the units and staff to utilise</td>
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<td></td>
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<tr>
<td>Exploiting day light instead of switching lights on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keeping lights, screens, and other devices on only when used</td>
<td></td>
<td></td>
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<tr>
<td>Avoiding unnecessary water run</td>
<td></td>
<td></td>
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<tr>
<td>Switching washing machines on not before they are full</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filling washing machines correctly and using correct programmes in them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoiding routine textile change</td>
<td></td>
<td></td>
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<tr>
<td>Ordering maintenance for leaking sanitary wear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reporting of unsuitable room temperature</td>
<td></td>
<td></td>
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<tr>
<td>Taking care of scheduled device maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installing light and water tap motion detectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filling waste bags full and tight to decrease waste transports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combining patient transports to allow joint transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing public transportation in hospital area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Favouring tele-medicine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combining and optimising material transports to hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commuting by walking, biking or using public transportation</td>
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<td></td>
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</tbody>
</table>

Second round results

Based on the second Delphi round, nurses assessed the central tasks considering the role of an environmental support person. The participants totally agreed (100% agreement) on three items. According to them, environmental support persons must highlight environmental affairs in team meetings, guide other staff into environmentally responsible practises, and assess and generally develop environmental improvements in the units. The participants also had high agreement (96 %) on the three next items. They agreed that environmental support persons must become educated and skilled in environmental procedures, ensure that new employees and students are oriented to the unit’s environmental procedures, and arrange a functional working environment for nurses. The nurses also agreed (89 %)
that composing unit-specific instructions belongs to the role of an environmental support person.

Nurses assessed the relevance of different stakeholders with environmental responsibility in nursing in hospital. Among the twelve groups of professionals, the nurses fully agreed (100 %) about the importance of a hospital’s environmental manager role in environmental responsibility, which was to coordinate and develop environmental affairs organisation-wide. Nurses very highly agreed (96 %) that nurse managers must encourage staff to act environmentally responsibly and ensure that they have sufficient environmental competency. Regarding the nursing staff’s role in environmental responsibility, nurses very highly agreed (96 %) that their role was to avoid unnecessary use of materials, water and electricity, and highly agreed (89 %) that they also need to observe possibilities for developing patient care practices towards environmental responsibility. The role of the ward pharmacist in ensuring that as little drug waste as possible is generated in the hospital unit also achieved very high agreement (93 %). Nurses also highly agreed (89 %) about administrators, hygiene nurses, housekeepers and students being important in developing and realising environmental responsibility. The administrator role was to integrate environmental responsibility as part of all decision making in hospitals. The hygiene nurse’s role was to consider the environment in infection control, and the housekeeper’s role was to act as waste experts. The student’s role was to act according to the units’ environmental guidelines. The role of support services in developing their own areas towards environmental responsibility also reached an agreement level (85 %), but it included the most (n = 4) “Can’t say” -answers. Patients also played a role in environmental responsibility by sorting their waste and avoiding unnecessary water running, although it barely reached agreement (78 %).

The nurses assessed the importance of different topics in their staffs’ environmental in-service training. The nurses fully agreed (100 %) on four topics: Responsible use of materials and energy, environmental effects of chemical and drug waste, the hospital’s environmental programme, and collaboration between different professional groups in realising environmental responsibility. Other contents focused on technical waste management processes (89 %) and climate change (78 %).

According to the nurses, several ways can be used to engage staff in environmental responsibility. Two engagement methods reached the nurses’ full agreement (100 %): visible environmental communication in hospitals, and reporting units’ consumption and waste volumes intra-organisationally. Three methods reached high agreement (96 %), namely arranging theme days and weeks, setting aims for material and energy consumption, and rewarding staff for progress. Providing functional premises to support biking for commuters was also considered important (100 %). The methods of providing financial support for using public transportation to commute (85 %) and arranging competitions among staff that focus on environmental responsibility (81 %) also reached agreement, but both received four “Partly disagree“ answers. The participants’ open answers reflected that they are not always able to use public transportation even if desired. Regarding
competitions, one participant specified that different units cannot be compared with each other.

Regarding the significance of the resources needed in the units for realising environmental responsibility, the nurses fully agreed (100 %) on two resource types: High quality, durable purchases and a functional work environment for waste sorting. Additionally, sufficient staffing reached high agreement (93 %). The nurses also evaluated guidance needed for environmental responsibility in patient care and reached high agreement (93 %). They also reached high agreement (96 %) on a nationally uniform environmental programme focused on specialised healthcare and unit-specific environmental aims.

5.5 SUMMARY OF THE RESULTS

5.5.1 Results according to the sub-studies

According to previous studies (sub-study I), environmental responsibility in nursing is based on ecology and environmental health. The arguments advocating it are ethics, health promotion, nursing ecological theory, economy, and legislation and regulations. The stakeholders needed to realise environmental responsibility are nursing staff, administrators, patients and relatives. The target of practice is responsible use of energy and materials, and the implementation tools are staff education, clear and updated protocols and guidelines, planning and organising practices, organisational collaboration, and continuous research.

Developing a semi-structured interview guide consists of five phases (sub-study II). The first phase identifies the prerequisites for using semi-structured interviews. The second phase retrieves and uses previous knowledge. The third phase formulates a preliminary semi-structured interview guide. The fourth phase pilot tests the guide, and the fifth phase presents the final guide used in the research in a study paper.

According to hospital environmental managers and programmes, environmental responsibility in hospital care (sub-study III) is based on authoritative tutelage and ethical values. Environmental responsibility targets the responsible use of materials and energy, including material and passenger transports. Environmental responsibility in hospital care requires different stakeholder roles, namely administrators, environmental managers, nurse managers, environmental support people, staff, and patients. Tools for implementing environmental responsibility in hospital care are multiprofessional collaboration, staff education and motivation, and continuous practice development.

According to the nurses (sub-study IV), opportunities to optimise material use in nursing include sustainable purchasing, considerate material use, and waste utilisation. According to them, energy use can be optimised by minimising idle electricity and water use and reducing traffic. Both administrative and nurse-level opportunities emerged in optimising material and energy use. Nurses were
unanimous about the role of an environmental support person in guiding other staff, highlighting environmental topics in team meetings, and ensuring environmental orientation for new staff members and students. They also included the tasks of arranging functional working environments, composing unit-specific environmental instructions, and assessing and generally developing environmental affairs as belonging to the environmental support person’s role. Other stakeholder groups needed in environmental responsibility are nursing staff, administrators, environmental managers, nurse managers, housekeepers, hygiene nurses, procurement professionals, ward pharmacists, staff in different support services, students, and patients.

The nurses highlighted the need for in-service training focused on responsible material and energy consumption, the environmental effects of pharmaceuticals and chemicals, a hospital’s environmental programme, environmental collaboration between different stakeholder groups, climate change, and technical waste management processes. Besides education, other methods needed to engage nurses in environmental responsibility are visible environmental communication in hospitals, reporting the units’ consumption and waste volumes openly in the organisation, theme days, competitions, setting aims for material and energy consumption, rewarding staff for progress, functional premises to support the staff’s ability to bike to work, and financial support for using public transportation to commute. Nurses thought that the resources they needed for environmental responsibility are functional working environment, high-quality, durable purchases, and sufficient staffing.

5.5.2 Cumulative results

As a summary of the sub-studies, this study provided cumulative knowledge of environmental responsibility and its implementation in nursing in hospital. The study produced the theoretical background, practical targets, stakeholder roles, tools for developing and implementing environmental responsibility, and the resources and guidance needed to realise it in nursing in hospitals. (Table 4.)

Theoretical background was found to consist of the frameworks of ecology and environmental health, from within which environmental responsibility emerges. Arguments and guiding principles are more practise-closed factors to advocate environmental responsibility and material and energy efficiency. Practical targets consist of optimal use of materials and energy, targeted to minimise consumption.

This study found that 12 different stakeholder groups were needed to carry out environmental responsibility in hospital (Table 4). Clarity regarding the roles of the stakeholders enabled collaboration and communality in environmental responsibility. Roles of the nursing staff in making optimal use of resources and of administrators in decision making were highly emphasised throughout the study. A variety of tools to develop and implement environmental responsibility in nursing was shown to be needed (Table 4). Nurses’ environmental degree education and in-service training emerged as highly important throughout the study. The tools also included means such as aim
setting, rewarding staff, communication in hospitals and providing staff inducements for a less polluting commute.

This study indicated that environmental responsibility requires the availability of certain resources in patient care units. One of the them was a functional working environment, which also was linked to the staff’s motivational engagement. Furthermore, the nurses pointed out that quality and durable purchases made in hospitals and sufficient staffing can promote environmental responsibility in practise. The guidance needed for environmental responsibility in nursing focused on the national, organisational, and unit levels. The national guidance was considered important to unify alignments and engage all the patient care institutions, including nursing staff working in them, in environmentally responsible policies and practises. Hospital environmental programmes were also considered important for systematically proceeding towards delivering responsible services in organisations.
Table 4. Cumulation of the knowledge in the different phases of the sub-studies I, III and IV

<table>
<thead>
<tr>
<th>Area of knowledge in environmental responsibility in nursing in hospitals</th>
<th>I: Review</th>
<th>III: Expert interviews</th>
<th>III: Document analysis</th>
<th>IV: Nurses' interviews</th>
<th>IV: Questionnaire data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical background</td>
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<tr>
<td>Ethics</td>
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<tr>
<td>Health promotion</td>
<td>x</td>
<td></td>
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<tr>
<td>Nursing ecological theory</td>
<td>x</td>
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<tr>
<td>Economy</td>
<td>x</td>
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<tr>
<td>Legislation and regulations</td>
<td>x x x x</td>
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<td></td>
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<tr>
<td>Practical targets</td>
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<tr>
<td>Sustainable material use</td>
<td>x x x x</td>
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<tr>
<td>Controlling hazardous materials</td>
<td>x x x x</td>
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<tr>
<td>Use of electricity and water</td>
<td>x x x x</td>
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<tr>
<td>Optimising traffic</td>
<td>x x x x</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Stakeholder roles</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nurses and other health professionals’ roles</td>
<td>x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaders’ roles</td>
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<td>Support services’ roles</td>
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<tr>
<td>Tools for development and implementation</td>
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<td>Ensuring of nurses’ competency</td>
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<td>Resources needed for realising environmental responsibility in nursing</td>
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<td>Guidance needed for environmental responsibility in nursing</td>
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<td>National level guidance</td>
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<td>Hospital level guidance</td>
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<tr>
<td>Unit level guidance</td>
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</table>
6 DISCUSSION

6.1 THE NECESSARY ELEMENTS TO ADVANCE ENVIRONMENTAL RESPONSIBILITY IN NURSING

This study focused on environmental responsibility in nursing in hospitals. It showed that environmental responsibility ultimately aims to protect human health and well-being and, thus, is a firm part of health promotion and ethics in nursing. Environmental responsibility is targeted to optimise the use of materials and energy, including the use of patient care support services. Scrutinising the results of this study, three main intersectional elements seem to be necessary to advance and enable environmental responsibility in nursing in hospitals, namely nurses’ training, sufficient resources and multilevel guidance.

The necessary element of nurses’ environmental training

This study’s findings, in line with previous knowledge (e.g. Adlong & Dietsch 2015b, Anåker & Elf 2014, Kangasniemi et al. 2018, McDermott-Levy et al. 2018), emphasise a need for nurses to acquire a new environmental competency. Previous studies (e.g., Álvarez-Nieto et al. 2017, Richardson et al. 2016, 2017), emphasise the significance of integrating the environmental topic into nurses’ degree education. This study supports those findings and recommends, together with Ryan-Fogarty et al. (2016), systematic environmental staff training and including it in a hospital’s environmental strategy to expand and complete nurses’ environmental competence.

The content of nurses’ environmental training should be observed considering their professionals role. First, nurses’ position in delivering primary prevention in hospital care emphasises need for their new health promotion knowledge. Traditionally, primary prevention has emphasised public health nurses’ role and competency in lifestyle guidance, in which outcomes are largely dependent on individual clients’ motivation to change their health habits. Health promotion that is based on environmental responsibility requires new insights, because the focus is on nurse’s concrete actions to prevent pollution and targets a population wider than individual clients. Terry et al. (2019) have noted that urbanised nurses may have lost their touch with nature. The reciprocal connection between humans and their environment is not necessarily self-evident to everyone, and a lack of understanding this can then inhibit nurses from behaving environmentally responsibly. To assimilate environmental responsibility into primary prevention, nurses need theoretical knowledge of what the reasons are and the consequences of environmental responsibility in hospitals and in the wider health sector (also Leffers et al. 2017, Schenk et al. 2015). Some areas, such as Australia and Africa, that are more vulnerable than others (IPCC 2014), raise climate change to an ethical dilemma of the human right to health and well-being. Thus, environmental responsibility highlights
the need for the joint liability of nurses all the way to a global level (also Adlong et al. 2015) and ethical aspects of environmental responsibility should be included in the health promotion training.

Second, considering nurses’ role in patient care practice, they need skills in how to optimise material and energy consumption in their practice, in relation to infection control, for example. Planning in-service training according to the specific needs at the unit level seems to motivate nurses. For example, the use of materials and practises are different when comparing the elective operation theatre to the acute emergency unit. Third, this study’s findings, together with previous ones (Dunbar-Reid & Buiskra 2017, Harris et al. 2009), emphasised nurses’ role in the development of environmental responsibility. This is why nurses must be familiar with the environmental programmes relevant to their work and patient care practise. However, as the fourth sub-study showed that nurses considered abstract and distant information rather useless, which is why including organisation-level information in the training should be carefully considered and justified. Thus, collaboration between a hospital’s environmental manager and its unit environmental support persons can be valuable in planning the training and to find the relevant content.

The necessary element of sufficient resources

The results of this and previous studies (Joshi et al. 2015, Vogt & Nunes 2014) showed that nurses’ opportunities to behave environmentally responsibly in the units requires certain resources. Functional working environment emerged as highly important. It is noteworthy that responding to current environmental requirements can often be challenging in older hospital buildings (also Nichols & Manzi 2014, Nichols & Mukonoweshuro 2017). As part of their physical work environment, the nurses highlighted durable and sustainable purchases, emphasising price-quality evaluation in hospital procurement. Use of cheap, low-quality care products, textiles and furniture often caused unnecessary waste of materials and energy, as also found in previous studies (Laustsen 2007, Naylor & Appleby 2013, Weiss et al. 2016). One example was old blankets made of cotton that did not warm a patient sufficiently, whereupon several of them needed to be used for each patient, causing a greater need for laundry. Sustainable purchasing emphasises the role of hospital administrators and their long-sightedness, as well as considering the nurses’ perspectives.

Related to the resources needed for environmentally responsible practice, the nurses in this study also highlighted the meaning of staffing. Having a sufficient number of nurses has been found to be a central determinant in the quality of care (Needleman et al. 2002), and, based on this study, it is also related to environmental responsibility. An environmentally responsible manner of practising, such as waste sorting or reprocessing medical equipment, requires work time. This is problematic in relation to the escalating shortage of nurses (WHO 2013). Previous studies have highlighted the need for governmental financial support for hospitals for the purpose
of promoting environmental affairs (Caniato et al. 2015b, Kim et al. 2018, Wang et al. 2016). Moreover, consideration will be required in the future of how to divide these tasks between different groups of professionals, such as nurses, housekeeping and technical staff, to make these practises most effective. Opportunities to use automation and robots (Kangasniemi et al. 2019) should also be considered to realise environmental responsibility.

The necessary element of multilevel guidance

This study’s findings emphasise the need to create guidance at the national, organisational and unit levels to support implementing environmental responsibility in nursing in hospitals. Regarding the national promotion of environmental responsibility in the health sector, laws and regulations provide directional guidance for hospital districts to prevent local environmental hazards. The third sub-study showed that a national environmental programme focused on the health sector has been lacking, and the hospitals’ strategic environmental work has been voluntary. The ministry-level work focused on decreasing environmental impacts in the health sector has been stated to be “nascent” (Mäkinnen et al. 2019). The nurses interviewed in this study were unanimous about the need to create the basic skeleton and alignments for environmental responsibility in healthcare to engage all the hospitals in environmental responsibility. Hence, this study foregrounds the necessity of promoting environmental responsibility in the health sector and hospitals with a nationally uniform programme.

This study emphasised organisation-level guidance and the administrators’ role in hospitals as crucial to guide, enable and support environmental responsibility in nursing. Top leaders were seen to have the power and position to strategically guide, observe environmental progress, evaluate improvements, and carry out interventions to optimise consumption in hospitals, as well as address stakeholders and their roles. Based on this study’s empirical data, hospital administrators play a crucial role in developing a pro-environmental culture in their organisation, that is, to support their staffs’ attitudes and sense of communal joint liability and efforts. The hospital administrator position, thus, highlights the importance of role modeling and setting an example for the staff, which was also found important by Joshi et al. (2015). Environmental communication in hospitals is one tool for this, although its form and content must be carefully considered. Collaboration and ideation between administrators and the hospital’s environmental, communication and nursing professionals when planning rousing and effective campaigns could serve that purpose. The administrators’ feedback for the units also emerged as highly valued and important when considering staff’s motivation and engagement. The third sub-study emphasised the importance of an organisation’s realistic environmental aims and of the administrators’ understanding of the nurses’ daily practises. These findings foreground the importance of involving nurses in environmental planning and development. As experts in daily patient care, nurses can bring their valuable
practise-close perspective and innovative ideas to the decision making, for example, when designing new hospital buildings, and functional premises (also Wood et al. 2016). A multiprofessional environmental team in a hospital can provide a forum for shared discussions and thus enable nurses’ involvement in regular organisational development (Brusco & Ogg 2010, CAN 2008). Administrators could also benefit from practise-close visits at patient care units to gain a deeper understanding of nurses’ practises and needs. Decision making to promote and ensure fluent patient care practises yields reciprocal benefits. It contributes to material and energy efficiency, to providing experienced, sensible work in nursing practises, and to economic savings and pollution prevention in organisations and the health sector.

Based on this study, unit-level guidance for the staff is also crucial in engaging nurses. This study found, in line with the results of Vogt and Nunes (2014), that the more specific and close to their practice the environmental aims were, the more motivating they were for the staff. Based on this study, the nurse manager’s role emerged as crucial when urging environmental responsibility forward at the unit level. The nurse manager’s role was optimal for highlighting environmental affairs among the nurses and, thus, for encouraging them to participate in the practises and developmental work. However, participants in this study and previous research (Anåker et al. 2015) pointed out that environmental affairs are seldom discussed in nurses’ meetings and are rare when compared to other nursing objectives. According to this study, environmental support persons appeared important for the practical peer support in hospital units, and, thus, they are nurse managers’ important collaborators in environmental development.

Even if the hospital administrator and nurse manager roles are necessary in environmental responsibility, environmental leadership in the health sector has been found to be deficient worldwide (Ard et al. 2016, Ashan & Rahman 2017, Candan Dönmez et al. 2019, Joshi et al. 2015). Zimmer and McKinley (2008) explained this, stating that leaders in health field often lack an understanding of the relation between the environment and human health. This advocates including an environmental focus in healthcare leaders’ and nurse managers’ education and making it visible in their professional publications and events.

6.2 METHODOLOGICAL DEVELOPMENT OF SEMI-STRUCTURED INTERVIEW GUIDE

This study identified qualitative methodology as important in studying the sparsely known topic (Malagon-Maldonado 2014, Polit & Beck 2010) of environmental responsibility in nursing. It enabled the production of knowledge of the central concepts and contents and created a basis for further research (Grove et al. 2013). The qualitative methodology allows a person-centered approach to studying people’s perspectives and experiences (Grove et al. 2013, Malagon-Maldonado 2014) and allows participants to tell about the topic “open-endedly” (Grove et al. 2013) and in their own words (Saddler 2008). The semi-structured interview was central for the
data collection, but peer-reviewed methodological papers that focused on the
development of a semi-structured interview guide process were lacking in the
literature. Thus, by reviewing previous methodological papers focused on the
development of semi-structured interview guide, this study created one to ensure
rigorous empirical findings. The review indicated that very few articles describing
the development process were available.

The semi-structured interview guide development process created in this study
was followed with building a data collection instrument for the nurse interviews.
Based on the pilot test and the actual research interviews, it can be discovered that
the interview guide was comprehensive and enabled the collection of comparable
data in different participant groups. Åstedt-Kurki and Heikkinen (1994) have
recommended that the semi-structured interview be used for topics that participants
are not used to talking about. As previous studies (Lipkin 2012, Peres et al. 2014,
Richardson et al. 2014, Soares et al. 2016) and the findings based on this study have
indicated, the topic of environmental responsibility has been relatively untold and is
unsettled among nursing communities. Based on this study, it was discovered that
the semi-structured interview was beneficial for the nurses’ small groups, where the
themes and follow-up questions stimulated thinking and discussion. The provided
questions and interaction between the participants enabled them to recall
occurrences and thoughts they previously had had in their worklife and to reflect on
them regarding the research interest. Furthermore, the semi-structured interview
guide development process is not limited to a certain field of science but can serve
the interdisciplinary researcher community.

6.3 ETHICAL CONSIDERATIONS

The ethical principles of integrity, meticulousness and accuracy were followed
through all the sub-studies (TENK 2019a). The specific questions of research ethics
in this study focus on research approvals and participant involvement. For the
empirical studies, research approvals were applied from each university hospital in
two phases: in 2012 for the purpose of key informant interviews and in 2018 for the
purpose of the Delphi-study. Using the environmental programmes as document
data did not require approvals, because they are public documents. External ethical
pre-assessment was not needed, as the participants were hospital staff interviewed
in their professional roles, and the interview questions covered worklife, not their
personal life (Medical Research Act 1999, TENK 2019b).

Ethical considerations regarding participant involvement include their informed
consent and identification. All participants received both written and oral research
information, to ensure their informed consent (Harris 2011), on the study’s purpose
and process, and were told that their participation was voluntary and confidential
and that they could withdraw any time without consequences. They signed a written
consent at the beginning of their interview. On the key informant study, participants
were rather identifiable considering the small size of the sample and their status in
the university hospitals. The participants were aware of this. Staff other than environmental support people participated in the Delphi study, which increased confidentiality in its publication. The results of both sub-studies were published so that no single participant or a hospital district could be recognised, dialect expressions were anonymised, and regionally recognisable information was not used. The participants in the small groups got to know other people participating in the same group. They were aware of this beforehand from the research information sent in the invitation email.

6.4 TRUSTWORTHINESS OF THE STUDY

The trustworthiness principles of confirmability, credibility and dependability (Shenton 2004) were considered during the study process. Confirmability, referring to the objectivity of the study (Shenton 2004), has been enhanced by working in firm collaboration between the research group members in all the study stages to minimise the researcher’s subjective influence on the results (Jensen 2008). The environmental managers in the key informant study had an opportunity to comment on the preliminary results. Credibility of the study refers to examining what truly was intended (Shenton 2004); this was enhanced by creating a process for developing a rigorous semi-structured interview guide. It also increased the study’s dependability, that is, enabling it to be repeated (Shenton 2004), as the last phase is to publish the interview guide in a research paper. Cumulating the knowledge in the different phases of the sub-studies (Table 4) also strengthens this study’s credibility.

There are some possible biases in this study. When conducting the first sub-study in 2012, earlier research on the environmental responsibility in nursing was very rare and fragmented. At the same time, the topic’s scope was wide. These factors set challenges for the relevant search word selection, and it is possible that some suitable studies were not found and used in the review. The selected studies did not only focus on nursing but healthcare more broadly. The second sub-study, because of the database functions, it wasn’t possible to limit searches to methodological studies; instead, an unusual limitation logic had to be used to find a reasonable number of papers (N = 2,703). In addition, methodological papers had to be manually selected from this result. These are the reasons why some suitable papers may have become excluded from the review. Sub-study IV had to exclude one statement sequence from the results, because some answers were contradictory between the agreement levels, open answers, and rating.
This study produced knowledge of environmental responsibility and its implementation in nursing in hospitals. The environment as a knowledge domain has developed in nursing science during the last decade, and currently it can be identified as gaining new meanings related to climate change and environmental health. Nurses must have novel competences to implement environmental responsibility in clinical practise. Environmental responsibility requires collaboration in a hospital, and nurses play a crucial role in contributing to practise development. Knowledge provided in this study can be used to evaluate and develop environmentally responsible practises and education.

The following conclusions can be drawn from this study:

1. Guidance and development of environmental responsibility in nursing emphasises multioperator collaboration in which leaders at the national, organisational, and unit level share the same view of the aims and support nurses in the creation of responsible practise.
2. Environmentally responsible practises in nursing require adequate resources, including peer-support from environmental support persons and nurse managers as facilitators of practises.
3. Ensuring nurses’ environmental competency is vital to achieve environmental responsibility in nursing, for which purpose, environmental in-service training in hospitals is needed.
4. The semi-structured interview is an established method of data collection in health research. The method’s trustworthiness can be improved by using a five stage process, including identifying the prerequisites for using semi-structured interviews, retrieving and using previous knowledge, formulating the preliminary semi-structured interview guide, pilot testing the guide, and presenting the complete semi-structured interview guide.

In the future, more research that focuses on the following is needed:

1. Identify the effective pedagogic methods to achieve nurses’ environmental competency and assess their work-life outcomes.
2. Identify the effective tools for supporting nurses and other health professionals to engage in environmentally responsible practises and assess their clinical practice outcomes.
3. Healthcare leaders’ perspectives on promoting environmental responsibility in nursing.
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Dögl, C. & Holtbrügge, D. 2014. Corporate environmental responsibility, employer
reputation and employee commitment: an empirical study in developed and
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APPENDICES
APPENDIX 1.

Table 5. Literature searches focusing on the topic of environmental responsibility in nursing

<table>
<thead>
<tr>
<th>patient care OR healthcare OR &quot;health care&quot; OR hospital OR hospitals OR &quot;health system&quot; OR nursing OR nurse* OR &quot;health professional&quot; AND</th>
<th>CINAHL*</th>
<th>PubMed*</th>
<th>Scopus*</th>
<th>Full-texts selected</th>
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<tbody>
<tr>
<td>&quot;environmental&quot; responsib* OR &quot;ecological&quot; responsib*</td>
<td>6(0)1</td>
<td>12(1)0 All text</td>
<td>15(1)0 Ti/Ab/KW</td>
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<td>&quot;environmentally friendly&quot; OR eco-friendly OR &quot;climate friendly&quot; OR climate-friendly</td>
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<td>186(0)1 All text</td>
<td>158(3)0 Ti/Ab/KW</td>
<td>2</td>
</tr>
<tr>
<td>&quot;ecological&quot; sustainab* OR &quot;environmental&quot; sustainab*</td>
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<td>130(4)0 All text</td>
<td>184(5)2 Ti/Ab/KW</td>
<td>7</td>
</tr>
<tr>
<td>&quot;environmental protection&quot;</td>
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<td>141(0)1 Title/abs</td>
<td>190(0)0 Abs</td>
<td>1</td>
</tr>
<tr>
<td>&quot;nature conservation&quot; OR &quot;conservation of nature&quot; OR &quot;nature protection&quot;</td>
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<td>50(0)0 Title</td>
<td>30(0)0 Ti/Ab/KW</td>
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</tr>
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<td>pro-environmental OR &quot;environmentally preferable&quot;</td>
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<td>13(0)0 Ti/Ab/KW</td>
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<td>&quot;over consumption&quot; OR overconsumption</td>
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<td>150(0)0 All text</td>
<td>79(0)0 Ti/Ab/KW</td>
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</tr>
<tr>
<td>energy-eff* OR material-eff*</td>
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<td>208(0)0 All text</td>
<td>202(1)0 Abs</td>
<td>0</td>
</tr>
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<td>greenhouse</td>
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<td>98(0)0 Title/abs</td>
<td>20(0)0 Title</td>
<td>1</td>
</tr>
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<td>&quot;climate impact&quot;*</td>
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<td>10(0)0 All text</td>
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</tr>
<tr>
<td>footprint</td>
<td>166(1)1</td>
<td>148(1)2 Title/abs</td>
<td>183(3)0 Abs</td>
<td>3</td>
</tr>
<tr>
<td>&quot;natural resources&quot;</td>
<td>136(3)0</td>
<td>37(0)0 Title/abs</td>
<td>98(0)0 Abs</td>
<td>0</td>
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<td>&quot;pollution prevention&quot;</td>
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<td><strong>1550(7)6</strong></td>
<td><strong>1854(17)3</strong></td>
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</tr>
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</table>

* All the articles found (Duplicates removed) Full-texts selected
APPENDIX 2.

Table 6. Description of the selected studies (n = 20) focusing on the topic of environmental responsibility in nursing

<table>
<thead>
<tr>
<th>Authors, year, country</th>
<th>Approach: Data collection method / Participants or sample</th>
<th>Field of healthcare / Environmental focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burke &amp; Stowe, 2015, Ireland</td>
<td>Quantitative: Recording radiography equipment electricity consumption / Two radiology departments</td>
<td>Radiology / Staff's electricity consumption</td>
</tr>
<tr>
<td>Candan Dönmez et al., 2019, Turkey</td>
<td>Quantitative: Questionnaire / Charge nurses (n = 18) in operating rooms from eleven hospitals</td>
<td>Surgery / Environmental responsibility in operating room</td>
</tr>
<tr>
<td>Dunbar-Reid &amp; Buisktra, 2017, Australia</td>
<td>Quantitative: Waste was weighted before and after a waste reduction activity/ Haemodialysis nurses (n = 61)</td>
<td>Nephrology / Waste reduction in haemodialysis</td>
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<tr>
<td>Dunphy, 2013, Australia</td>
<td>Qualitative: Interviews / Health professionals and educators (n = 64)</td>
<td>Healthcare / Environmental sustainability</td>
</tr>
<tr>
<td>Dunphy, 2014, Australia</td>
<td>Qualitative: Interviews / Health professionals and educators (n = 64)</td>
<td>Healthcare / Healthcare professionals' environmentally responsible behavior</td>
</tr>
<tr>
<td>Furukawa et al., 2016, Brazil</td>
<td>Quantitative: Observations before and after a waste reduction project / Medication processes (n = 648) performed by nurses</td>
<td>Intensive care / Waste generation in the medication processes performed by nurses</td>
</tr>
<tr>
<td>Furukawa et al., 2016b, Brazil</td>
<td>Quantitative: Waste was measured before and after a waste reduction project / Pharmacy and nursing staff of a medical-surgical unit in one large hospital</td>
<td>Hospital's medical-surgical unit / Waste generation in the medication processes performed by nurses</td>
</tr>
<tr>
<td>Furukawa et al., 2017, Brazil</td>
<td>Quantitative: Observations before and after a quality improvement intervention / Nurses (n = 99 &gt; 97), a total of 648 medication processes</td>
<td>Intensive care / Environmental responsibility in medication processes performed by nurses</td>
</tr>
<tr>
<td>Johnson et al., 2013, USA</td>
<td>Quantitative: 1) Observation / 17 areas in one hospital 2) Pre/post training questionnaire / health professionals (n = 120 &gt; 99)</td>
<td>Hospitals / Staff's waste behaviour</td>
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<tr>
<td>Manika et al., 2016, UK</td>
<td>Quantitative: Interviews, observations, questionnaires before and after a social marketing intervention / Health professionals (n = 14), patients (n = 70 &gt; 88) from two hospitals</td>
<td>Hospitals / Staff's electricity consumption</td>
</tr>
<tr>
<td>Manzi et al., 2014, UK</td>
<td>Qualitative: Observations / Health and social care sites (n = 4), six full-day observation periods</td>
<td>Health and social care / Staff's waste behaviour</td>
</tr>
<tr>
<td>Authors</td>
<td>Research Methodology</td>
<td>Setting</td>
</tr>
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<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>McGain et al., 2016, Australia</td>
<td>Quantitative: Energy consumption was calculated / One hospital's central sterile and supply department, 8760 hours during one year</td>
<td>Sterilising services / Staff's energy consumption</td>
</tr>
<tr>
<td>Nichols &amp; Manzi, 2014, UK</td>
<td>Qualitative: Observation, interviews / Healthcare staff (n = 16)</td>
<td>Neonatal intensive care / Staff's waste behaviour</td>
</tr>
<tr>
<td>Nichols et al., 2013, UK</td>
<td>Qualitative: Interviews / Healthcare staff (n = 20)</td>
<td>Healthcare / Waste management</td>
</tr>
<tr>
<td>Nichols &amp; Mukonoweshuro, 2017, UK</td>
<td>Qualitative: Interviews / Nursing staff (n = 5)</td>
<td>Neonatal unit / Staff's waste behaviour</td>
</tr>
<tr>
<td>Peres et al., 2014, Brazil</td>
<td>Qualitative: Interviews / Healthcare staff (n = 22)</td>
<td>Primary healthcare / Staff's practise</td>
</tr>
<tr>
<td>Sari &amp; Camponogara, 2014, Brazil</td>
<td>Qualitative: Document research, interviews / Hospital employees (n = 9)</td>
<td>Hospitals / Staff's environmental education</td>
</tr>
<tr>
<td>Shenck et al., 2015, USA</td>
<td>Qualitative: Interviews / Experts in environmental competences in nursing (n = 7)</td>
<td>Nursing / Environmental competency</td>
</tr>
<tr>
<td>Vatovec et al., 2013, USA</td>
<td>Qualitative: Observations, interviews / Healthcare and support staff (n = 79) from three end-of-life settings</td>
<td>End-of-life care / Procurement</td>
</tr>
<tr>
<td>Vogt &amp; Nunes, 2014, Germany</td>
<td>Quantitative: Questionnaire / Healthcare staff (n = 616) in six hospitals</td>
<td>Hospitals / Staff's waste behaviour</td>
</tr>
</tbody>
</table>
ORIGINAL PUBLICATIONS (I – III)
Towards environmentally responsible nursing: a critical interpretive synthesis

Mari Kangasniemi, Hanna Kallio & Anna-Maija Pietilä

Abstract

Aim. To provide a synthesis of studies on the environmental issues in nursing.

Background. Interest in the environmental issues affecting health sciences has been increasing in recent decades. Health care is one of the largest publicly provided services and its share of the environmental burden is high. Nurses play an important role in environmental health issues as they are the largest group of healthcare staff and are most directly connected to the use of energy and materials. Despite this, previous studies on nurses’ roles in environmental issues have been presented in a relatively fragmented way.

Design and data sources. Systematic literature searches of peer-reviewed papers published between 2002–2012 were carried out using the CINAHL, Science Direct and PubMed electronic databases.

Review method. Critical interpretive synthesis was then undertaken to provide a comprehensive overview of the topic.

Results. Eleven studies were included. Based on our synthesis, environmentally responsible nursing can be identified in relation to the: (1) theoretical framework; (2) background arguments; (3) role of responsible stakeholders; and (4) targets of environmental management. A fifth element: (5) tools for practical environmental responsibility, was also presented.

Conclusion. Awareness of environmental issues is starting to encourage nursing services to seek sustainable practices. Nurses themselves are naturally in a key position to promote and develop environmentally responsible nursing. Environmentally responsible nursing helps to promote healthy environmental practices. It also reduces undesirable practices that can burden the environment and have a negative impact on health.

Keywords: critical interpretive synthesis, ecology, environmental health, environmentally, global warming, greening, health care, hospital, nursing
Introduction

Interest in environmental issues affecting health care has increased in recent decades, due to worldwide concern for global warming and limited natural resources (World Health Organization & Health Care Without Harm (WHO-HCWH) 2009). Based on our current scientific understanding of this issue, human activities have a significant impact on climate change (AASA (The Association of Academies of Sciences in Asia) 2010, NAS (The National Academy of Sciences) 2010, IPCC (Intergovernmental Panel on Climate Change) 2013, NASA (National Aeronautics & Space Administration) 2013). As a result, the health sector needs to take responsibility for the influence it has on climate change (World Health Organization (WHO) 2009) and protect the environment (Health Care Without Harm (HCWH) 2011). An advanced approach to the environmental issues in health care has been presented in different international and national policy papers and programmes. International organizations, such as the United Nations (UN 1987) and World Health Organization (WHO 2009, 2012) and networks like Health Care Without Harm (HCWH 2011), the Environmental Protection Agency (EPA 2013) and Practice Greenhealth (PGh 2013), have provided a strong focus on the need to promote and develop environmentally responsible policies in health care. Furthermore, numerous hospitals (Johnson 2010) have presented the result of their implementations of national and local environmental policies.

The policy documents developed by organizations with an interest in environmental responsibility in health care highlight a number of key issues. These include energy efficiency in the use of water (National Health Services (NHS) 2009, HCWH 2011, Environmental Protection Agency (EPA) 2013, Practice Greenhealth (PGh) 2013), purchasing environmentally friendly products (HCWH 2011, EPA 2013, PGh 2013), sustainable waste management (NHS 2009, HCWH 2011, PGh 2013, EPA 2013, United Nations Environment Programme (UNEP) 2013), food (NHS 2009, HCWH 2011 PGh 2013), chemicals (HCWH 2011, PGh 2013) and pharmaceutical items (HCWH 2011). Environmental issues relating to travel and transport (NHS 2009, HCWH 2011) and the design of the built environment (NHS 2009, HCWH 2011, PGh 2013) have also been highlighted.

The participation of nurses in environmental issues has been highlighted by several nursing associations, such as the International Council of Nursing (ICN 2008), Association of Perioperative Registered Nurses (AORN 2006) and American Nurses Association (ANA 2007). These have emphasized several key areas, including the ethical reasons why nurses commit to environmental issues (AORN 2006, ANA 2007), their duty to contribute (ICN 2008), carrying out initiatives (AORN 2006), taking part in preventive actions (ANA 2007) and assessing and developing current practices and policies (ANA 2007). In addition, awareness of environmental issues and continuous learning have been connected to the nurses’ professional skills (ICN 2008).

Despite active and advanced political interest in the environmental issues affecting nursing, these have been studied in a relatively fragmented way. However, nurses play a key role in handling and planning environmental issues in healthcare practice because they are close to energy consumption and product use (Topf 2005). Nursing practice within the walls of their hospitals also affects the environment (Parry et al. 2007, Sayre et al. 2010) and therefore, the health of the population outside the hospital (Hall 2008, Harris et al. 2009). The concern for nurses’ limited competence in environmental issues has been presented in...
literature (Kleffel 2006) and, as a result, improvements in healthcare practices (Topf 2005), education (Hall 2008, Truckner 2009), organizational collaboration (Day 2005, Topf 2005, EPA 2013) and research (Laustsen 2006) have been demanded.

The review

Aim

The aim of this paper was to synthesize previous studies of environmental issues in nursing science by using Critical Interpretive Synthesis (CIS).

Design

CIS is a research method used in literature reviews that enables researchers to synthesize large amounts of diverse literature (Dixon-Woods et al. 2006, Flemming 2010). CIS was selected as a research method for several reasons: (1) the need to synthesize previous studies (Hart 1998); (2) there are few previous studies on environmental nursing; (3) previous studies have been conducted using different methods (Flemming 2010); and (4) the literature review can serve as a tool for evidence-based practice and decision-making (Jones & Evans 2000, Fain 2004, Polit & Beck 2012).

The ultimate purpose of this CIS was to produce a synthesis that would bring together the many different elements of environmental issues in nursing in a useful and explanatory way (see e.g. Bonikowsky et al. 2012). This CIS follows the iterative, reflexive approach, comprising the following phases: formulating the review question, searching for the literature, sampling, determining the quality, extracting data and conducting an interpretive synthesis (Dixon-Woods et al. 2006, Talseth & Gilje 2011).

Our research question was: what does environmentally responsible nursing consist of? According to the CIS method, research questions in systematic literature review methodologies cannot be identified a priori (Flemming 2010). Our research question was relatively broad, because one of the aims of CIS is to allow the definition of the phenomenon to emerge from the analysis of literature. The research question should be a compass rather than an anchor (Dixon-Woods et al. 2006) and finally established at the end of the review (Flemming 2010).

Search methods

Electronic databases, such as CINAHL, Science Direct and PubMed, were used for the literature search. Search terms included ‘health care’ OR ‘hospital*’ OR ‘nursing’. These were combined with nine different words or groupings of words, together with MeSH terms such as ‘ecology’, ‘ecosystem’ and ‘waste-management’ and free keywords as ‘environmentally friendly’ OR ‘eco-friendly’, ‘environmental ethics’, ‘green practices’, ‘greening’, ‘environment* management’ and ‘pollution prevention’. Language was not limited, but the search was confined to 2002–2012.

Search outcome

Two of the researchers (MK, HK) conducted the database searches (N = 828) and selected the abstracts (n = 44). Both researchers read all the titles and abstracts separately and agreed on the final selection. All the full texts were read by three researchers (MK, HK, A-MP) and the decision on the final papers (N = 11) was unanimous (Figure 1).

The inclusion criteria for original studies were that they had to respond to the research question and be related to nursing aspects on environmental issues. Studies were excluded if the original study covered another field of environmental issues. The inclusion and exclusion criteria were pre-tested and discussed between the researchers during the initial searches and found to be appropriate.

Quality appraisal

All of the studies we included were published in peer-reviewed scientific journals. The quality appraisal checklist by Dixon-Woods et al. (2006) was used for all studies and each quality domain was categorized as by ‘yes’, ‘no’ or ‘not reported’ (Table 1). All of the studies were included (Dixon-Woods et al. 2006) because studies with weak methodological standards can also contain theoretical relevance (Kazimierczak et al. 2013) or conceptual insight (Entwistle et al. 2012) related to the phenomenon. The quality of the original papers was judged by two researchers, working in collaboration and agreed by all three authors.

Data abstraction

During the first phase, selected studies were read repeatedly to establishing an overview of the data. Basic information about the study aims and methods (Table 2) and definition of the main concepts that were used (see also Kazimierczak et al. 2013) was collected from each study. The systematic tabulation of each paper we included ensured that all the studies were relevant to the research question (Flemming 2010).
Data synthesis

The CIS synthesis process is adapted from meta-ethnography by Noblit and Hare (1988) to provide four steps (Dixon-Woods et al. 2006, Flemming 2010): (i) Determining how studies are related to each other. In our process, this included understanding studies in relation to themselves and also in relation to other selected studies. Questions for

Figure 1 Selection process of original studies.

Inclusion criteria:
1. Responded to research question
2. Original article published as scientific publication

Exclusion criteria:
1. Not related to research question
2. Not a scientific publication

Inclusion criteria:
1. The title included at least one search term or related term and responded to research question
2. Scientific publication or publication where scientific level unclear

Exclusion criteria:
1. Not a scientific publication
2. Published before 2002

Inclusion criteria:
1. Responded to research question
2. Original article published as scientific publication

Exclusion criteria:
1. Not related to research question
2. Not a scientific publication

Inclusion criteria:
1. Responded to the research question
2. Published after year 2002

Exclusion criteria:
1. Clearly formulated research question/aim
2. Scientific structure of the rapport
3. Relevant and adequate reference list

Phase 1.
Electronic search result = 828 original studies

Phase 2.
Included based on the title of the article (n = 97)

Phase 3.
Included based on the abstract of the article (n = 44)

Phase 4.
Included based on the full text (N = 11)
Table 1 Quality appraisal according to the checklist by Dixon-Woods et al. (2006).

<table>
<thead>
<tr>
<th>Author(s), year</th>
<th>Are the aims and objectives of the research clearly stated?</th>
<th>Is the research design clearly specified and appropriate for the aims and objectives of the research?</th>
<th>Do the researchers provide a clear account of the process by which their findings were reproduced?</th>
<th>Do the researchers display enough data to support their interpretations and conclusions?</th>
<th>Is the method of analysis appropriate and adequately explicated?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burg &amp; daSilveira (2008)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Conrardy et al. (2010)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Kwakye et al. (2011)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Laustsen (2006)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Melamed (2003)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mostafa et al. (2009)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Podein &amp; Hernke (2010)</td>
<td>Not reported</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Primozic (2010)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Riedel (2011)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Somner et al. (2008)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Topf (2005)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 2 Selected studies.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Aim/purpose</th>
<th>Design/method</th>
<th>Data/sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conrardy et al. (2010)</td>
<td>To evaluate the standards of reusable and disposable in the field of OR.</td>
<td>Quantitative and qualitative descriptive methods</td>
<td>119 procedures at 12 surgical services in two hospitals, 172 surgeons and surgical technologists</td>
</tr>
<tr>
<td>Kwakye et al. (2011)</td>
<td>To identify leading practices to promote environmentally friendly and efficient efforts in the provision of surgical health care.</td>
<td>Literature review, qualitative methods</td>
<td>7 subject experts, 43 articles</td>
</tr>
<tr>
<td>Laustsen (2006)</td>
<td>To present a nursing ecological theory.</td>
<td>Theoretical, theory derivation description</td>
<td>Literature</td>
</tr>
<tr>
<td>Melamed (2003)</td>
<td>To examine environmental and pollution prevention issues in perioperative setting.</td>
<td>Theoretical discussion</td>
<td>Literature</td>
</tr>
<tr>
<td>Mostafa et al. (2009)</td>
<td>To assess the knowledge and practice associated with waste management and to design and validate a waste management protocol.</td>
<td>Quantitative and qualitative descriptive methods</td>
<td>38 doctors, 106 nurses, 56 housekeepers</td>
</tr>
<tr>
<td>Podein and Hernke (2010)</td>
<td>To integrate the idea of sustainability and health care.</td>
<td>Theoretical discussion</td>
<td>Literature</td>
</tr>
<tr>
<td>Primozic (2010)</td>
<td>Explore the role of public hospitals as role models of climate change policy in relation to their primary purpose.</td>
<td>Theoretical discussion</td>
<td>Literature</td>
</tr>
<tr>
<td>Riedel (2011)</td>
<td>To determine the environmental and financial impact of recycling at the acute care hospital.</td>
<td>Quantitative, descriptive methods and correlations</td>
<td>Waste of 148-bed hospital</td>
</tr>
<tr>
<td>Somner et al. (2008)</td>
<td>To investigate water use during surgical scrubbing.</td>
<td>Quantitative descriptive method and correlations</td>
<td>50 scrubs by 14 nurses and 13 doctors at two hospitals</td>
</tr>
<tr>
<td>Topf (2005)</td>
<td>To describe an environmental crisis in hospitals detailed by psychological phenomena.</td>
<td>Theoretical discussion</td>
<td>Literature</td>
</tr>
</tbody>
</table>
original studies described by Flemming (2010) were used: what does an original paper say in relation to other studies and what it does not? (ii) Translating the studies into one another refers to the process where themes, metaphors and concepts used by authors were identified and translated from one study into another to produce a reduced account of the content and concepts of all studies; (iii) Synthesizing translations included connecting the content of individual papers to the coherent response for research questions, aiming to maintain original knowledge but producing a unique wholeness; (iv) Expressing synthesis (Dixon-Woods et al. 2006) by incorporating interpretations by the authors of this study (Flemming 2010).

Results

The 11 selected studies used the following methods: one mixed-method (qualitative and theoretical), five quantitative studies and five theoretical studies. Seven of them were published in the USA and one each in Australia, Brazil, Egypt and the UK (Figure 2).

There was extensive variation among the concepts mentioned in connection with the research question. We identified four conceptual categories: environment, greening, ecology and sustainability. These concepts were combined with approaches such as behaviour, friendliness, practice and responsibility (Table 3).

Based on our synthesis, environmentally responsible nursing can be identified in relation to the: (1) theoretical framework (ecology and environmental health); (2) background arguments, (3) the role of responsible stakeholders; and (4) the targets of environmentally important areas of responsibility. In addition, we presented (5) the tools for environmentally responsible nursing (Figure 3).

Two inseparable frameworks – ecology and environmental health

Based on our findings, two different but inseparable theoretical frameworks were defined for environmental issues in nursing – ecology and environmental health. Ecology was defined as a major framework in relation to the balance between living organisms on the planet and ecosystems (Laustsen 2006). Health care, as a large service sector, was found to play an important role in affecting
ecology and ecosystems because it produces greenhouse gases (Somner et al. 2008, Burg & daSilveira 2008, Riedel 2011) that contribute to global warming (Melamed 2003) and expose humans to health risks (Primozic 2010). This means that hospitals that are clean and responsible when it comes to consuming and disposing of products protect both nature and the general public (Riedel 2011). At a local level, hospitals can cause health hazards through the improper waste disposal of substances like mercury (Melamed 2003, Kwakye et al. 2011). Nurses have a duty and the opportunity, to prevent these problems to improve the environmental health of the public, patients and staff (Melamed 2003). For this reason, environmental health forms the other major framework for environmental nursing.

Table 3 Concepts mentioned in relation to the research question.

<table>
<thead>
<tr>
<th>Category</th>
<th>Concepts</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Environmental responsibility</td>
<td>Melamed (2003)</td>
</tr>
<tr>
<td></td>
<td>Environmental practices</td>
<td>Conrardy et al. (2010)</td>
</tr>
<tr>
<td></td>
<td>Environmentally responsible</td>
<td>Topf (2005)</td>
</tr>
<tr>
<td></td>
<td>behaviour</td>
<td></td>
</tr>
<tr>
<td>Pro-environment</td>
<td>environmentally friendly</td>
<td>Topf (2005)</td>
</tr>
<tr>
<td></td>
<td>behaviour</td>
<td>Conrardy et al. (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kwakye et al. (2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laustsen (2006)</td>
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<tr>
<td></td>
<td></td>
<td>Riedel (2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sommer et al. (2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Topf (2005)</td>
</tr>
<tr>
<td></td>
<td>Environmentally healthy</td>
<td>Topf (2005)</td>
</tr>
<tr>
<td>Greening</td>
<td>Greening</td>
<td>Conrardy et al. (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kwakye et al. (2011)</td>
</tr>
<tr>
<td></td>
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<td>Laustsen (2006)</td>
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<td></td>
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<td>Melamed (2003)</td>
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<tr>
<td></td>
<td></td>
<td>Podein and Hernke (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primozic (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Topf (2005)</td>
</tr>
<tr>
<td>Green behaviour</td>
<td></td>
<td>Laustsen (2006)</td>
</tr>
<tr>
<td></td>
<td>Green practices</td>
<td>Kwakye et al. (2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primozic (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Topf (2005)</td>
</tr>
<tr>
<td></td>
<td>Eco-friendly</td>
<td>Kwakye et al. (2011)</td>
</tr>
<tr>
<td></td>
<td>Climate-friendly</td>
<td>Riedel (2011)</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Sustainable practices</td>
<td>Podein and Hernke (2010)</td>
</tr>
</tbody>
</table>

Arguments for environmentally responsible nursing

Based on our findings, the reasons for advancing environmentally responsible nursing were: ethics, health promotion, nursing ecological theory, economy and legislation and regulation. Ethics was described as a strong value-based argument for environmental issues in nursing that combines both the quality (Burg & daSilveira 2008, Primozic 2010, Kwakye et al. 2011) and safety of care (Melamed 2003, Laustsen 2006, Burg & daSilveira 2008, Conrardy et al. 2010, Podein & Hernke 2010) through healthy environment and public health promotion (Melamed 2003, Podein & Hernke 2010, Primozic 2010, Kwakye et al. 2011, Riedel 2011). Environmental justice (Melamed 2003) and the responsibility for future generations (Podein & Hernke 2010) were also found to be ethical imperatives for taking environmental issues into account. Therefore, health care has a social obligation to reduce pollution (Primozic 2010), as do nurses in the course of their clinical duties (Melamed 2003).

Health promotion has been recognized as a reason for taking environmental issues in nursing into account (Melamed 2003). In general, health care promotes professional activities that minimize negative effects on health in both local and global environments (Melamed 2003, Podein & Hernke 2010). By being environmentally friendly, they are able to reduce potential human and environmental threats to human health (Melamed 2003). Burg and daSilveira (2008) also highlighted their role in providing information and Primozic (2010) suggested that the role of public hospitals is to raise public awareness and educate patients and the local community on the health risks of global warming.

The foundation of environmentally responsible nursing is also based on nursing ecological theory by incorporating it into holistic care (Laustsen 2006) and by taking into account ecological principles and behaviour while caring for patients’ needs. The concept of the chain of causation, based on the same theory and principles as ecological sciences, is essential: that environmental hazards caused by health care eventually add to the load of health care. In Laustsen’s proposed nursing ecological model, a human health ecosystem includes the healthcare provider, clients, affiliates and the healthcare environment. The model illustrates a need for these components to interact dynamically to secure environmental advancements.

Economy was also found to be a key reason for taking into account environmental issues in nursing (Kwakye et al. 2011). Simple actions and changes led to notable savings in energy consumption (Somner et al. 2008, Kwakye et al. 2011) and reduced the number of
consumables that were disposed of (Conrardy et al. 2010, Riedel 2011). Short-term expenditure by an environmentally responsible hospital could lead to long-term benefits (Somner et al. 2008, Riedel 2011). For instance, Riedel’s (2011) quantitative study revealed how adding single-stream recycling to one hospital’s non-hazardous disposal practices saved more than $4670 in 6 months, not to mention 346 trees.

Legislation and regulations were formulated as an official foundation for environmentally responsible nursing. International principles such as UN 1987 (Podein & Hernke 2010) were commonly found in global health care, but national and local practices were more closely guided by national regulations in several countries (Burg & daSilveira 2008, Primozic 2010). These regulations were directed towards specific factors such as the use and origin of energy, greenhouse gases and carbon emissions. As Melamed (2003) pointed out, in reference to the AORN guidelines, hospital environmental policies and procedures need to be written in accordance with local state and federal regulations.

The role of responsible stakeholders
According to several papers (Topf 2005, Burg & daSilveira 2008, Mostafa et al. 2009, Primozic 2010), environmentally responsible health care was shared by all hospital stakeholders.

Nursing staff
Nurses play an important practical role in clinical care (Topf 2005, Mostafa et al. 2009) and this has an impact on environmental responsibility in the hospital, as they spend more time with patients on the ward than any other member of the staff (Mostafa et al. 2009) and they are also close to the issues of waste management and energy consumption (Riedel 2011). Nurses also play a role in creating hospital environmental connections and committees and greening teams (Melamed 2003), where they can share innovative ideas about how to make hospitals more environmentally friendly. With the right education and training, nurses can become even experts on environmental issues.

Figure 3 The elements of environmentally responsible nursing.

* Added based on discussion among authors during the research process.
(Melamed 2003) and for example, provide information on the effects of climate change on health (Primozic 2010).

**Administration**

The authors of the selected papers agreed that implementing nurses’ views and theoretical environmental programmes widely into practice requires strong involvement by hospital administrators. To lead the development of green policies (Topf 2005), top hospital administrators need to perform several central roles. These include: establishing resources and policy and ensuring that they are implemented, employing specific representatives, performing critical analysis and ensuring continuous improvements at strategic and operational levels (Burg & daSilveira 2008).

In addition to ensuring that environmentally responsible activities are made possible, administrators play an important role in removing barriers around attitudes and changing behaviour and supporting staff. Administrators also need to expand needs to expand collaboration outside the hospital and consult the experts as architects and engineers, if they are to diversify the planning of environmental responsibility (Topf 2005).

**Patients and relatives**

Laustsen (2006) found that healthcare clients and affiliates, such as families, affect environmental care. Burg and daSilveira (2008) found that patients were unaware of what finally happened to hospital waste and said that they also need information about environmental responsibility. This information referred to patients’ preferences on how waste should be disposed of in an environmentally friendly way.

**The targets of environmentally responsible practice in nursing**

According to selected studies, there were two main practical issues to be observed and targeted to manage environmentally responsible nursing: energy and product consumption.

**Energy consumption**

*Use of electricity.* Electricity use was one of the most important issues in everyday nursing and consisted of both the origin and consumption of energy. The origin of energy (Podein & Hernke 2010, Primozic 2010) and hospitals’ energy efficient solutions (Kwakye et al. 2011) have an impact on the emissions produced.

From the point of view of nurses’ practices, the critical question is the amount of electricity used (Topf 2005, Somner et al. 2008). At the moment, excessive energy use in nursing practice is partly related to the increased use of medical technology (Kwakye et al. 2011). Energy consumption can be directly reduced by turning off unused lights and devices, such as monitors, pumps and computers (Topf 2005, Kwakye et al. 2011). It can also be indirectly reduced by conserving natural resources and purchasing environmentally friendly products (Melamed 2003), recycling (Riedel 2011) and using recycled materials (Topf 2005), minimizing supply use and waste production (Melamed 2003, Conrardy et al. 2010). Investing in green buildings, energy effective plants and equipment (Somner et al. 2008, Kwakye et al. 2011) and using clean, renewable energy (Primozic 2010) provide an important basis for operating eco-friendly hospitals.

**Water use.** Water use was found to be crucial in the consumption of energy, with studies covering both warm (Somner et al. 2008) and cold water (Burg & daSilveira 2008). Avoiding unnecessary linen washing (Topf 2005) and running water (Topf 2005, Somner et al. 2008, Burg & daSilveira 2008) are reasonable ways to reduce energy consumption. Moreover, water consumption depends on technical solutions (Somner et al. 2008). Somner et al. (2008) found notable savings due to a simple technological innovation in sanitary tap design. Changing all the taps in the UK National Health Service operation theatres to a newer model could save $3 \times 10^6$ kWh of energy in water heating costs every year (Somner et al. 2008), the equivalent of heating 200 single family houses a year in Northern Europe.

**Consumption of products and materials**

*Purchasing.* If the amount of materials purchased for hospitals is reduced (Melamed 2003), it ultimately leads to reduced waste and environmental conservation. It is important to buy non-toxic products and materials that are easy to recycle and to favour recycled materials, which avoid the use of virgin raw materials (Riedel 2011). Nurses have an important role to play in evaluating the use and need of products at the care level (Melamed 2003).

Choosing between single-use and reusable products seems to raise several questions. Single-use products have been preferred, due to concerns about the safety of reusable products. However, according to the US Government Accountability Office, there is no evidence that reusing devices increases health risks (Kwakye et al. 2011). In the case of disposable items, considerations include analysing life-cycle consequences (impacts of the product from material extraction to the length of landfill time) (Melamed 2003, Conrardy et al. 2010, Riedel 2011), costs (production, transport, storage, use, disposal), delivery and work load (Conrardy et al. 2010).
Waste management. Over the past decades, the health care industry has embraced disposable products – many of them made of plastic (Melamed 2003). Health care is the second leading contributor of waste, with operating rooms producing 70% of that waste (Kwakye et al. 2011). Several of the studies included here were particularly concerned with the reduction of medical waste from operating rooms (Melamed 2003, Mostafa et al. 2009, Conrardy et al. 2010, Kwakye et al. 2011).

Waste management can be divided into two elements: using products and waste disposal (Conrardy et al. 2010). It is essential to reduce the use of products (Kwakye et al. 2011). Custom packs could be checked for unnecessary products or instruments, as they often contain items routinely not used (Conrardy et al. 2010). Correct waste disposal means sorting different types of waste (Kwakye et al. 2011) and recycling (Riedel 2011). Because some healthcare waste needs to be carefully disposed of, it is important that regular material is put in the right containers so that it can be recycled (Melamed 2003). Furthermore, incorrect waste sorting poses a health risk for both workers and off-site communities due to wrong disposal methods (Mostafa et al. 2009).

Tools for environmentally responsible nursing

Several tools to plan and promote environmentally responsible nursing were defined.

Sufficient and focused education

Several researchers have indicated the need to raise and identify the level of staff’s environmental awareness in the first phase (Burg & daSilveira 2008, Mostafa et al. 2009, Riedel 2011). They have pointed out the importance of nurses understanding the effects of their personal and professional behaviour on the environment and ecosystems and efforts to prevent pollution (Melamed 2003). Diverse education is essential if this is to be achieved, including guidance, continuous training, self-study, information booklets, supervision, new employees’ orientation and annual updates (Melamed 2003, Mostafa et al. 2009). Mostafa et al. (2009) expressed the view that that practical hands-on training is particularly important for nurses.

Clear and updated protocols and guidelines

It is important for healthcare institutions to develop clear and updated protocols and guidelines for the practice and continuity of environmental management. In particular, waste management protocols must be convenient and sensible (Mostafa et al. 2009). Clear instructions are important for successful measuring and for environmental advance (Burg & daSilveira 2008). Consistent terminology between guidelines and clinical practice was important when developing environmental practices (Melamed 2003, Mostafa et al. 2009, Conrardy et al. 2010, Kwakye et al. 2011). To sort different types of waste and reduce waste volumes successfully, costs and incineration toxicity, personnel need to be very clear about the differences between regular healthcare waste and special waste (Melamed 2003).

Planning and organizing

Planning is basically theoretical, but also includes putting in place the solid foundations that enable practical action. For example, proper waste management is a key way of reducing hospitals’ environmental burden (Riedel 2011), and making sure that the right procedures are in place to achieve this is important for environmentally responsible nursing practice. This is connected to waste management protocols for instance and educating staff to use the facilities correctly (Riedel 2011). In addition, installing new, energy effective technology supports environmental behaviour (Somner et al. 2008). Planning and organizing referred not only to occasional performance but also to environmental programmes and continuous improvements. It is important to make the measurements and improvements visible that new goals can be achieved (Burg & daSilveira 2008).

Organizational collaboration

Organizing and achieving effective environmental management in a hospital require the involvement of all employees and levels of organization (Burg & daSilveira 2008, Mostafa et al. 2009). A hospital is a multi-professional institution and the level of knowledge about hospital waste management may vary between the different professional groups (Mostafa et al. 2009). In addition, the working by one discipline has relatively limited contributions to plan and implement environmentally responsible measures. Therefore, interdisciplinary organizational practice in collaboration with other stakeholders outside the hospital is needed. (Topf 2005)

Continuous research

According to Somner et al. (2008), quantitative studies make it possible to identify opportunities for healthcare organizations to reduce their impact on the environment. Kwakye et al. (2011) revealed a strong need for better and more widespread environmentally friendly initiatives in the medical community, based on the literature and on empiri-
hospital employees, there are wider, even Towards environmentally responsible nursing 11 2013 John Wiley & Sons Ltd 2010) researchers et al. the patients. Nonetheless, perceiving environmental impacts to the need to achieve the highest possible quality care to environmental issues are directly and indirectly connected to environmental responsibility (Kwakye et al. current patients, clients and consumers expect and appreci- ation between all those involved. In addition, the need for continuous research was highlighted. Based on previous studies, there is no conceptual consensus on the phenomenon of environmentally responsible nursing. Our analysis showed that it could be defined as follows: (i) ‘environmentally’ refers to the global and local impacts on ecology; (ii) ‘responsible’ refers to the ethical and legal values, norms and guidelines of environmental issues; and (iii) ‘nursing’ refers to the discipline, but also, in the wider sense, to the multi-professional practice of patient care. On the basis of our findings, we focused on four critical questions: The first question is the relevance of problem setting for environmentally responsible nursing and the arguments put forward for it. As Sayre et al. (2010) highlighted, the challenge of global warming is rather new in health care, despite strong global awareness and the long-term work by the World Health Organization and different associations (ANA, AORN, EPA, ICN). Health professionals’ encounter human health impacts that resulted from global warming (Truckner 2009), but they can also prevent global warming (Sayre et al. 2010). However, the responsibility for environmental issues is important because of future generations (Tietenberg & Lewis 2010). The aim is to protect the public, staff and environment (Melamed 2003). In that sense, current patients, clients and consumers expect and appreciate environmental responsibility (Kwakye et al. 2011) and environmental issues are directly and indirectly connected to the need to achieve the highest possible quality care to the patients. Nonetheless, perceiving environmental impacts and relations is an important part of holistic responsible nursing (Laustsen 2007, Harris et al. 2009), professional pursuits (Laustsen 2006) and ensuring patient safety (Kwakye et al. 2011). The second critical question is ‘who is responsible for environmental issues in nursing?’ Unsuccessful environmental initiatives in hospitals have even been called a crisis (Topf 2005). Having conducted the synthesis, we believe that this is caused by several factors: an inability to cooperate, lack of clear programmes, education, pressures of other problems in health care and attitude barriers. The literature concerning environmental responsibility in health care says that collaboration is the solution (Macklem & Neumann 2003, Burg & daSilveira 2008, Mostafa et al. 2009). Environmental responsibility concerns all hospital employees, from maintenance staff to top administrators. Patients are also responsible for using resources such as water and electricity and disposing of waste. Hospital managers play a crucial role in making policies visible, implementing programmes and educating staff about how to act in an environmentally responsible way (Macklem & Neumann 2003, Mostafa et al. 2009, UNEP 2013). The third critical question is the role of a nurse. As the largest group of health professionals, nurses have an obvious role in minimizing the environmental burden of health care. On a practical level, this means eliminating unnecessary energy and product use. However, it is worth noting that nurses’ roles in and responsibility for environmental issues are not limited to clinical settings. They should exceed their professional limits, limits of their unit and even those of their hospital. When it came to nurses’ knowledge of environmental issues (Melamed 2003, Mostafa et al. 2009) and staff’s enthusiasm for adopting new practices (Laustsen 2007, Conrardy et al. 2010) researchers expressed controversial and diverse views. Environmental issues in nursing are perhaps one of the typical examples of current and future questions in health care. The question is not limited to one profession, specialty, or discipline, to one level, district or section within or between healthcare organizations. It is, by nature, a moral, political and legal question that has to be solved by all those who are involved working together. In addition, it is not just a local issue – there are wider, even global, perspectives that have to be taken into account. Policy discussions in the field of nursing and health care are remarkably extensive and advanced compared with the scientific discourse. Consequently, the fourth critical issue is current research as it represents several methodological approaches and frameworks and focuses on the crucial issues. However, the phenomenon of environmental issues
is rapidly moving forwards and requires scientific contributions to evidence-based practices. In the future, environmental issues in nursing need to be studied using different theoretical frameworks and approaches. Moreover, we need to consider nurses’ awareness and skills, and the conditions needed for the successful implementation and development of different policies and guidelines in nursing practice.

Limitations

Despite the fact that we have used a precise methodology, there is a risk of methodological bias. The scope of this study is relatively wide and this might have complicated formulating the successful search words. The decision to limit the search to the nursing-related aspects is incompatible with the empirical world, where environmental work in hospitals is mostly connected to other fields such as waste management and food services. In addition, previous research has seldom focused clearly on the perspective of nurses in environmental issues, which weakens evidence for understanding and describing the topic in the literature review.

Conclusion

Based on our synthesis, high-quality nursing recognizes both environmental values and efforts. Human health and nature are closely connected and irresponsible healthcare organizations can contribute to global warming and public insecurity by using natural resources recklessly. Therefore, nurses need to consider their patients as part of the public and protect our mutual environmental health through ecologically reasonable care. The primary issue here is to minimize energy and material consumption and to avoid waste by, for example, recycling. Environmentally responsible health care requires the commitment of hospital administrators and staff at all levels. Nurses are the healthcare occupation with most employees and they work closely with patients. This means that they play a critical role in observing and highlighting diverse opportunities for promoting environmentally responsible nursing and health care.

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Conflict of interests

No conflict of interests has been declared by the authors.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/ethical_1author.html)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

References


Abstract
Aim. To produce a framework for the development of a qualitative semi-structured interview guide.
Background. Rigorous data collection procedures fundamentally influence the results of studies. The semi-structured interview is a common data collection method, but methodological research on the development of a semi-structured interview guide is sparse.
Design. Systematic methodological review.
Data sources. We searched PubMed, CINAHL, Scopus and Web of Science for methodological papers on semi-structured interview guides from October 2004–September 2014. Having examined 2,703 titles and abstracts and 21 full texts, we finally selected 10 papers.
Review methods. We analysed the data using the qualitative content analysis method.
Results. Our analysis resulted in new synthesized knowledge on the development of a semi-structured interview guide, including five phases: (1) identifying the prerequisites for using semi-structured interviews; (2) retrieving and using previous knowledge; (3) formulating the preliminary semi-structured interview guide; (4) pilot testing the guide; and (5) presenting the complete semi-structured interview guide.
Conclusion. Rigorous development of a qualitative semi-structured interview guide contributes to the objectivity and trustworthiness of studies and makes the results more plausible. Researchers should consider using this five-step process to develop a semi-structured interview guide and justify the decisions made during it.
Keywords: interview guide, methodology, nursing, qualitative research, semi-structured interview, systematic review, thematic interview
Introduction
It has been agreed that in a qualitative study, as in research methods in general, rigorous data collection procedures are the main factors that influence quality and trustworthiness (Kitto et al. 2008) and critically influence the results of the study (Gibbs et al. 2007). Interviews are the most commonly used data collection method (Taylor 2005) and the semi-structured format is the most frequently used interview technique in qualitative research (DiCicco-Bloom & Crabtree 2006) and in a healthcare context (Gill et al. 2008).

Despite the popularity of this data collection method, there is a lack of uniform, international advice in the literature on how to develop a semi-structured interview guide and the aim of this review was to produce a rigorous tool for this purpose.

Background
The reason why the semi-structured interview is a popular data collection method is that it has proved to be both versatile and flexible. It can be combined with both individual and group interview methods (DiCicco-Bloom & Crabtree 2006) and the rigidity of its structure can be varied depending on the study purpose and research questions (Kelly 2010). One of the main advantages is that the semi-structured interview method has been found to be successful in enabling reciprocity between the interviewer and participant (Galletta 2012), enabling the interviewer to improvise follow-up questions based on participant’s responses (Hardon et al. 2004, Rubin & Rubin 2005, Polit & Beck 2010) and allowing space for participants’ individual verbal expressions (RWJF (Robert Wood Johnson Foundation) 2008).

The use of semi-structured interviews requires a certain level of previous study in the research topic area (Wengraf 2001, RWJF 2008, Kelly 2010) because the interview questions are based on previous knowledge. The questions are determined before the interview and formulated using the interview guide (Mason 2004, Rubin & Rubin 2005, RWJF 2008). The interview guide covers the main topics of the study (Taylor 2005). It offers a focused structure for the discussion during the interviews but should not be followed strictly. Instead, the idea is to explore the research area by collecting similar types of information from each participant (Holloway & Wheeler 2010), by providing participants with guidance on what to talk about (Gill et al. 2008).

The semi-structured interview is often perceived as an easy data collection method (Wengraf 2001). However, the researcher should consider several issues when preparing an interview guide and a central question is the depth of information to be collected. Although the goal of the qualitative researcher is to gain a rich understanding of the study phenomenon (Polit & Beck 2010), it is ethically dubious to collect data that is not completely necessary for the research (Gibbs et al. 2007). Several textbooks have focused on designing semi-structured interviews adequately (e.g. Wengraf 2001, Morrow 2005, Rubin & Rubin 2005, Kvale 2007, Galletta 2012). Nevertheless, there have been questions about how user-friendly they are because of their complexity and excessive detail (Gibbs et al. 2007). On the contrary, methodological research on the development of semi-structured interviews is sparse. Several editors of scientific publications have highlighted the importance of rigour when conducting and reporting qualitative studies (Salmon 2013, Bell 2014, Cleary et al. 2014). This review was conducted to provide a practical tool for researchers developing a semi-structured interview guide as a data collection method.

The review

Aim
The aim of this systematic methodological review was to produce a framework for developing a qualitative semi-
structured interview guide, to improve the trustworthiness of qualitative research. The research question we explored was: ‘What are the phases of the development of a qualitative semi-structured interview guide?’

Design

This study employed a systematic methodological review. The review was conducted by adapting the theory review method (Campbell et al. 2014).

Search methods

We carried out systematic literature searches (Campbell et al. 2014), exploring empirical and theoretical scientific methodological papers or research reports that focused on the development of semi-structured interview guides. There were no restrictions on study type and as this was a methodological review, we decided to include papers that synthesized evidence that focused on the development of semi-structured interview guides. We acknowledge that it is unusual to include evidence syntheses and primary studies in a review. Checks were made to ensure that studies were not double-counted by inclusion in evidence syntheses and inclusion as primary studies. We conducted searches using the PubMed, CINAHL, Scopus and Web of Science electronic databases. Searches were initially limited to papers that were peer-reviewed and published in scientific journals, in English, between 1 October 2004–30 September 2014. We chose the search terms based on preliminary searches on the methodological literature and also consulted an information specialist. MeSH terms were not applicable and, as a result, free words were used. Due to the general nature of the methodological terms, we adjusted the year limitations and the field options of title or abstract. When the search result on all fields within the 10-year period was too high, with each database search resulting in thousands of papers, we limited it to 5 years. If the result was still too high, we limited the search to abstracts during the 10-year period and then reduced it to a 5-year period if necessary. If the result was still too high, we limited the search to titles, but in this case, we did not use any year limitations. That is why two papers from 1994 were included in our findings. This search method provided 2,703 papers.

We selected papers in two stages (Figure 1), using pre-defined inclusion and exclusion criteria (Campbell et al. 2014). Because of the vague nature of the titles, we conducted the first-stage selection by reading both the titles and abstracts. During this stage, our inclusion criteria were that the title or abstract mentioned methodological question(s) in relation to a semi-structured interview guide. We excluded studies if they focused on the other types of interviews, such as structured and open or diagnostic and clinical interviews. The first-stage selection was conducted independently by two of the authors (HK, MK) and resulted in 21 full texts. During the second stage, we selected papers based on full texts and redefined our inclusion criteria, so that the full text had to focus explicitly on the development of a semi-structured interview guide. The exclusion criterion was that the study focused on the other phases of the semi-structured interview, such as the selection of participants. The second-stage selection eventually resulted in 10 papers and was based on the consensus between all of the authors.

Search outcome

The 10 papers we selected were published between 1994–2015 (Table 1) and were theoretical, methodological papers. One paper was originally defined as a discussion paper (Barrriball & While 1994) and one as a conceptual paper (Cridland et al. 2015). The methods used were not specified in eight papers. Seven of the studies were published in journals covering health sciences and three in a journal that focused on qualitative research methods. Three studies were conducted in the UK, three in the USA and one each in Australia, Canada, Finland and Malaysia. The phases of the semi-structured interview guide development were described in two papers (Barrriball & While 1994, Krauss et al. 2009), while other papers focused on semi-structured interview questions (Astedt-Kurki & Heikkinen 1994, Dearnley 2005, Whiting 2008, Turner 2010, Chenail 2011, Rabionet 2011, Cridland et al. 2015) and semi-structured interview guide development (Baumbusch 2010).

Quality appraisal

All the selected papers were theoretical and the quality appraisal criteria for methodological studies were not available. However, during the selection process, it was crucial to consider the quality of papers (Campbell et al. 2014) to make sure that we only selected scientific methodological papers or research reports. We only selected papers that were structured as scientific methodological articles, based on scientific and relevant references and published in peer-reviewed journals.

Data abstraction

During the first phase of the analysis, we read papers several times to gain an overall understanding of the content.
Fig. 1 Flow chart of the literature searches and selection of original studies.
After that, the data were extracted (Campbell et al. 2014) and tabulated based on the titles, aims, methods and the main results. We extracted information concerning the phases of the development of a semi-structured interview guide. In original papers, this information was presented in the sections called introduction, results or discussion.

Table 1  Description of the selected papers.

<table>
<thead>
<tr>
<th>Authors (year) (country)</th>
<th>Aim</th>
<th>Method (data)</th>
<th>Content of the paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barriball and While (1994) (UK)</td>
<td>To address the issues of validity and reliability in a semi-structured interview*</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Validity and reliability in a semi-structured interview. Describing the process of developing an interview schedule.</td>
</tr>
<tr>
<td>Baumbusch (2010) (Canada)</td>
<td>To describe semi-structured interviewing style for specialists in paediatric nursing</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Designing the interview guide and conducting a semi-structured interview. Describing the structure and stages of a semi-structured interview guide.</td>
</tr>
<tr>
<td>Chenail (2011) (USA)</td>
<td>To describe the approach of interviewing the investigator for addressing instrumentation and researcher bias in qualitative research*</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Tools for addressing bias in qualitative research. Describing the features of discovery-oriented interview questions.</td>
</tr>
<tr>
<td>Cridland et al. (2015) (Australia)</td>
<td>To provide reflections and recommendations on all stages of the qualitative research process*</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Experiences of conducting qualitative research with families living with autism spectrum disorder. Describing the structure and type of questions in a semi-structured interview guide.</td>
</tr>
<tr>
<td>Dearneley (2005) (UK)</td>
<td>To offer a reflective insight into using semi-structured interviews as a method of data collection*</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>A reflective insight into using semi-structured interviews as a data collection method. Describing the features of semi-structured interview questions.</td>
</tr>
<tr>
<td>Krauss et al. (2009) (Malaysia)</td>
<td>To assist qualitative researchers by illustrating in detail one approach for developing a useful and relevant interview guide</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Describing the development of a semi-structured interview guide as a seven-step process.</td>
</tr>
<tr>
<td>Rabionet (2011) (USA)</td>
<td>To summarize a researcher's personal journey in crafting an interview protocol*</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>The required stages to be followed in conducting a semi-structured interview study. Briefly describing the development of interview questions.</td>
</tr>
<tr>
<td>Turner (2010) (USA)</td>
<td>To explore the effective way to conduct in-depth qualitative interviews for novice investigators by employing a step-by-step process for implementation</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Qualitative interview designs, suggestions for conducting qualitative interviews. Describing research question construction.</td>
</tr>
<tr>
<td>Whiting (2008) (UK)</td>
<td>To prepare nurses for conducting semi-structured interviews</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Semi-structured interviews as a research tool and a process. Describing types of questions in semi-structured interviews.</td>
</tr>
<tr>
<td>Åstedt-Kurki and Heikkinen (1994) (Finland)</td>
<td>To consider the applicability of a thematic interview and narrative method for nursing research</td>
<td>Theoretical, methodological, discussion paper (literature)</td>
<td>Thematic interview and narrative method as a data collection method. Briefly describing the idea of interview themes.</td>
</tr>
</tbody>
</table>

*Due to a lack of information in the original papers, these descriptions have been formulated by the authors based on the full text.

Synthesis

We analysed the content of the papers (Campbell et al. 2014) according to the research question using the qualitative content analysis method (Elo & Kyngäs 2008). All the information about the semi-structured interview method...
and its phases were identified, grouped and named inductively as sub-categories based on their similarities and differences. After that sub-categories were grouped together and allocated to the main categories, which covered the various phases of the study methods. (Elo & Kyngäs 2008.)

Results

In the 10 selected papers, the method was named as ‘semi-structured interviews’ in seven papers, ‘thematic interviews’ in one study (Åstedt-Kurki & Heikkinen 1994) and qualitative interviews in two studies (Turner 2010, Chenail 2011). The form of interview questions was called an ‘interview guide’ in four papers and there was one each called an ‘interview schedule’ (Barriball & While 1994), an ‘interview framework’ (Dearley 2005), an ‘interview protocol’ (Rabionet 2011) and ‘instrumentation’ (Chenail 2011). Concepts also varied in relation to interview questions. The main themes were called ‘general questions’ (Krauss et al. 2009), ‘guiding questions’ (Baumbusch 2010), ‘themes’ (Åstedt-Kurki & Heikkinen 1994), ‘topics’ (Barriball & While 1994, Cridland et al. 2015) and just ‘questions’ (Dearley 2005, Whiting 2008, Chenail 2011, Rabionet 2011, Cridland et al. 2015). In addition, concepts varied in relation to ‘follow-ups’ (Turner 2010, Chenail 2011), ‘prompts’ (Whiting 2008, Baumbusch 2010) and ‘probe’ questions (Barriball & While 1994, Whiting 2008, Krauss et al. 2009, Baumbusch 2010, Turner 2010, Rabionet 2011).

Based on our results, the semi-structured interview guide development included five phases: (1) identifying the prerequisites for using semi-structured interviews; (2) retrieving and using previous knowledge; (3) formulating the preliminary semi-structured interview guide; (4) pilot testing the interview guide; and (5) presenting the complete semi-structured interview guide.

Identifying the prerequisites for using semi-structured interviews

The first phase was to identify the prerequisites for using semi-structured interviews. The aim of this phase was to evaluate the appropriateness of the semi-structured interview as a rigorous data collection method in relation to the selected research question(s). According to the selected studies, the researcher needed to be able to determine some areas of the phenomenon based on previous knowledge before the interview (Turner 2010). In relation to the research topics, the semi-structured interview method was suitable for studying people’s perceptions and opinions or complex (Barriball & While 1994) or emotionally sensitive issues (Barriball & While 1994, Åstedt-Kurki & Heikkinen 1994). The method was also appropriate when participants had a low level of awareness of the subject or when there were issues that participants were not used to talking about, such as values, intentions and ideals (Åstedt-Kurki & Heikkinen 1994). In a semi-structured interview, it was possible to focus on the issues that were meaningful for the participant, allowing diverse perceptions to be expressed (Cridland et al. 2015).

Retrieving and using previous knowledge

The second phase of the development was retrieving and using previous knowledge. The aim of this phase was to gain a comprehensive and adequate understanding of the subject, which required critical appraisal of previous knowledge and the possible need for complementary empirical knowledge. Previous knowledge created a predetermined framework for the interview (Barriball & While 1994, Turner 2010). It was based on pre-interview preparations (Turner 2010) and it was important for the researcher to have a good grasp of the substance of the research (Rabionet 2011). The critical appraisal of previous knowledge could be conducted by carrying out an extensive literature review (Barriball & While 1994, Krauss et al. 2009) focused on the purpose of the study (Krauss et al. 2009). Thus, previous knowledge created a conceptual basis for the interview (Åstedt-Kurki & Heikkinen 1994).

In the case of sparse or fragmented knowledge in the literature, empirical knowledge could be used to complement and deepen the theoretical background. Consulting experts was one way of gaining the empirical knowledge to seek understanding of the study phenomenon (Krauss et al. 2009, Rabionet 2011). Consulting could be conducted using focus group interviews comprising participants who were experts in their field and could freely describe the study phenomenon. Fragmented previous knowledge could also be supplemented with one or more workshops with research team members. (Krauss et al. 2009). In addition, methodological guidance and feedback from the other qualitative researchers could be used (Rabionet 2011).

Formulating the preliminary semi-structured interview guide

The third phase of the development was formulating the preliminary semi-structured interview guide. The aim of this phase was to formulate an interview guide as a tool for interview data collection, using previous knowledge on structural, logical and coherent forms. An interview guide
has been defined as a list of questions (Whiting 2008, Krauss et al. 2009), which directs conversation towards the research topic during the interview (Astedt-Kurki & Heikkinen 1994, Krauss et al. 2009, Rabionet 2011, Cridland et al. 2015). The quality of the interview guide affects the implementation of the interview and the analysis of the collected data (Barriball & While 1994, Krauss et al. 2009, Rabionet 2011, Cridland et al. 2015). The form of a semi-structured interview guide was considered loose (Astedt-Kurki & Heikkinen 1994, Dearnley 2005) and flexible (Dearnley 2005, Turner 2010), which allowed dialogue during an interview (Whiting 2008, Cridland et al. 2015), the opportunity to change the order of the questions (Dearnley 2005) and easy movement from question to question (Astedt-Kurki & Heikkinen 1994).

The questions in the interview guide were described, to achieve the richest possible data (Turner 2010). Well-formulated questions in the guide were participant-oriented (Barriball & While 1994) and not leading, and also clearly worded (Astedt-Kurki & Heikkinen 1994, Turner 2010), single-faceted (Cridland et al. 2015, Baumbusch 2010) and open-ended (Dearnley 2005, Whiting 2008, Krauss et al. 2009, Turner 2010, Chenail 2011). The aim of the guide was to generate answers from participants that were spontaneous, in-depth (Dearnley 2005, Baumbusch 2010), unique (Krauss et al. 2009) and vivid (Dearnley 2005). This meant that the answers reflected the interviewees’ personal feelings (Whiting 2008) and stories (Rabionet 2011) and the interview guide could produce data allowing new concepts to emerge (Dearnley 2005, Krauss et al. 2009). Descriptive answers could be encouraged by starting questions with words like what, who, where, when or how (Chenail 2011). In some cases, the word why could also be used (Turner 2010).

A semi-structured interview guide consisted of two levels of questions: main themes and follow-up questions. The main themes covered the main content of the research subject and within them participants were encouraged to speak freely about their perceptions and experiences. Every participant would usually be questioned on the main themes (Astedt-Kurki & Heikkinen 1994). The order of the main themes could be progressive and logical (Krauss et al. 2009). They could be used as a warm-up to break the ice and create a relaxed environment (Whiting 2008, Krauss et al. 2009, Rabionet 2011, Cridland et al. 2015). These questions could be about issues that were familiar to the participant yet central to the study subject (Whiting 2008). After that the order of the main themes could move from the lighter ones to more emotional and in-depth ones (Whiting 2008, Baumbusch 2010, Cridland et al. 2015) and then end on lighter themes again (Baumbusch 2010).

Follow-up questions were used to make the main themes easier for the participant to understand (Turner 2010) and to direct conversation towards the study subject (Baumbusch 2010). The aim was to maintain the flow of the interview (Whiting 2008) and gain accurate (Barriball & While 1994, Whiting 2008, Baumbusch 2010, Rabionet 2011) and optimal information (Turner 2010). Follow-up questions could be pre-designed (Whiting 2008, Rabionet 2011) or spontaneous based on the participant’s answer (Whiting 2008, Turner 2010, Chenail 2011). Pre-designed follow-up questions could be beneficial in increasing the consistency of the subjects covered by interviews carried out by different interviewers (Krauss et al. 2009). As a spontaneous follow-up question, the interviewer could ask participants to expand on some particular point that came up in the interview, by asking for more information (Whiting 2008) or an example of the issue (Dearnley 2005).

Verbal and non-verbal probing techniques could be used as follow-up questions. Examples of verbal probes included repeating the participant’s point, expressing interest with verbal agreement (Whiting 2008, Turner 2010) or giving the impression that the interviewer was aware of certain information. Non-verbal probing referred to remaining silent and allowing the participant to think aloud (Whiting 2008).

Pilot testing of the interview guide

The fourth phase of the development was pilot testing the semi-structured interview guide. The aim of this phase was to confirm the coverage and relevance of the content of the formulated, preliminary guide and to identify the possible need to reformulate questions and to test implementation of it. By testing the interview guide, it was possible to make informed changes and adjustments to the interview questions (Barriball & While 1994, Chenail 2011) and improve the quality of data collection (Chenail 2011). Testing could also produce useful information about research integrity and improve the pre-assessment of research ethics and the researcher’s ability to conduct data collection (Chenail 2011). Based on our analysis, the pilot test of the interview guide could be conducted using three different techniques: internal testing, expert assessment and field-testing.

Internal testing referred to the evaluation of the preliminary interview guide in collaboration with the investigators in the research team (Barriball & While 1994, Chenail 2011). This technique could provide critical information about the interview guide in general, for instance removing ambiguities and inappropriate leading questions (Barriball & While 1994) and highlighting any possible interviewer...
bias (Chenail 2011). Researchers might also assume the role of the participant and be interviewed themselves by another researcher. Gaining an insight into how it felt to be interviewed, promoted the ethical and responsible way that the research was conducted around sensitive issues. This technique could also be useful if other types of pilot test were not possible (Chenail 2011).

*Expert assessment* referred to exposing the preliminary interview guide to a critique by specialists outside the research team. Assessment by external specialists was particularly beneficial in assessing the appropriateness and comprehensiveness of the interview guide contents in relation to the aims and the subjects of the study. It allowed the interviewing researcher to discuss the relevance of the questions and gain valuable guidance about the wording and the arrangement of the questions (Barriball & While 1994).

*Field-testing* referred to a technique where the preliminary interview guide was tested with the potential study participants. This form of testing was the most commonly used in the development of a semi-structured interview process (Barriball & While 1994, Krauss et al. 2009, Turner 2010). Field-testing simulated the real interview situation (Barriball & While 1994, Chenail 2011) and provided crucial information about the implementation of the interviews (Turner 2010). Testing the preliminary guide with potential participants could be used to assure intelligibility (Barriball & While 1994, Chenail 2011), make the questions more relevant (Krauss et al. 2009, Chenail 2011) and determine whether they truly elicited the participants’ varied perceptions and experiences (Barriball & While 1994, Chenail 2011). Based on field-testing, the order and form of the questions could be re-formulated to be more practical. The effectiveness of the questions could also be assessed and follow-up questions could be refined to improve the coverage of the interview guide (Krauss et al. 2009). Field-testing was also beneficial as it enabled the interviewer to decide how much time was needed for each session (Chenail 2011, Cridland et al. 2015) or if there were some other flaws or limitations in the design (Turner 2010, Chenail 2011).

**Presenting the complete semi-structured interview guide**

The fifth and last phase of the development process was presenting the complete semi-structured interview guide in the study paper. The aim was to produce a clear, finished and logical semi-structured interview guide for data collection. The guide that was presented was based on and reflected the previous phases of the development process (Krauss et al. 2009). It provided a useful mechanism for responding to the aims of the study (Barriball & While 1994) and was universal so that other researchers could also use it (Krauss et al. 2009).

**Discussion**

Based on our findings, previous studies concerning the development of a semi-structured interview guide were sparse and fragmented. In our study, we produced new synthesized knowledge of semi-structured interview guide development and formulated the aims and content for each phase of the process (Figure 2). According to our findings, the inter-related phases of the development process were: (1) identifying the prerequisites for using semi-structured interviews; (2) retrieving and using previous knowledge; (3) formulating the preliminary semi-structured interview guide; (4) pilot testing the interview guide; and (5) presenting the complete semi-structured interview guide. Developing a semi-structured interview guide rigorously contributes to the trustworthiness of the semi-structured interview as a qualitative research method.

According to our findings, the phases of the development process were inseparable. The five phases were inter-related, as each phase contributed to the preparation and success of the next. The development process started with a critical scrutiny of whether the study purpose and question(s) can be answered by the semi-structured interview method. If the prerequisites of using the method were achieved, the researcher proceeded to the second phase, using the previous knowledge as a basis for formulating the preliminary interview guide. The literature review offered an essential basis for mapping previous knowledge. It was noteworthy, however, that a diversely composed, comprehensive semi-structured interview guide often required complementing theoretical background with empirical information using the knowledge of experts in the subject and other researchers.

Having retrieved and mapped the previous knowledge, the researcher proceeded to the third phase, which was formulating the preliminary interview guide. There are many things to consider during this phase when it comes to formulating an interviewee- and interviewer-friendly guide. One of them is how to achieve balance between the main themes and follow-up questions, which differs depending on the purpose of the interview. To avoid leading the participant’s responses, the main themes usually dominate the interview pattern and the only necessary follow-up questions are ‘gentle nudges’ that are used if the participant has difficulties, for example in understanding the main theme (Smith & Osborn 2008). However, in some cases, it might be beneficial to only have a couple of main questions...
A framework for the development of a qualitative semi-structured interview guide

**Aim:** Formulating the preliminary interview guide

- **Aim:** to formulate an interview guide as a data collection tool, by operationalizing the previous knowledge to the structural, logical and coherent form

**Main themes**
- Cover the main content
- Progressive, logical order

**Follow-up questions**
- Clarify the main themes
- For the fluency of conversation
- For gaining accurate, optimal information
- Pre-designed and spontaneous

**Internal testing**
- General critique
- Making interviewer bias visible

**External testing**
- Testing practicality of questions
- Testing practicality of questions
- For refining follow-up questions

**Expert assessment**
- Scrutiny of the content

**Internal pilot testing**
- Testing implementation
- - Field-testing
- - Pretesting

**Presenting the complete interview guide**
- Aim: to produce a clear, finished and logical guide for data collection

**Credibility**
- As extensive as possible
- Critical appraisal of previous knowledge
- To gain a comprehensive and adequate understanding of the subject

**Dependability**
- Testing practicality of questions
- Testing practicality of questions
- For refining follow-up questions

**Confirmability**
- Testing implementation
- - Field-testing
- - Pretesting

**Trustworthiness of the study**
- Testing practicality of questions
- Testing practicality of questions
- For refining follow-up questions

- Critical appraisal of previous knowledge
- To gain a comprehensive and adequate understanding of the subject

**Aim:** Retrieving and utilizing the previous knowledge

- **Aim:** to gain a comprehensive and adequate understanding of the subject

**Literature review**
- Critical appraisal of previous knowledge
- As extensive as possible

**Empirical complements**
- Consulting experts
- Workshops for the research team
- Knowledge of other qualitative researchers

**Exported data and information**
- As extensive as possible

**Aim:** Identifying the prerequisites to use a semi-structured interview

- **Aim:** to evaluate how appropriate a semi-structured interview is as a rigorous data collection method in relation to the selected research question(s)

**Building the main themes and follow-up questions**
- Clarify the main themes
- For the fluency of conversation
- For gaining accurate, optimal information
- Pre-designed and spontaneous

**Figure 2** The phases of a semi-structured interview guide development based on the synthesis/review (* added based on the section of discussion).

The phases of a semi-structured interview guide development based on the synthesis/review (* added based on the section of discussion). supported by several follow-up questions. For example, when the aim of the study is concept clarification, follow-up questions are used to approach different nuances of the concept (Rubin & Rubin 2005), to provide ‘funnelling’ towards specific questions of particular concern (Smith & Osborn 2008). Ethical considerations related to the research process are also highlighted in this phase. While formulating effective interview questions, the researcher has to make sure that the questions do not cause harm for the participants. Spontaneous follow-up questions can also create an ethical dilemma, as some ethical review boards want to assess every interview question in advance (Kvale 2007).

According to our findings, in the fourth phase, pilot testing, the researcher exposed the preliminary interview guide to critique and scrutiny to see if changes were needed. Pilot testing is often understood to be testing the study feasibility by collecting data using a small sample of participants who are similar to the actual study participants (Maxwell 2013). Our results showed that interview techniques and content perspectives could also be expanded by consulting other researchers and experts on the subject. Combining all the pilot test forms most certainly resulted in diverse perception of the preliminary interview guide but could be burdensome and too time-consuming compared with the study purpose.

Thus, based on the earlier development phases, the researcher has to determine which areas of the preliminary guide need particular scrutiny and choose the appropriate pilot test form(s). It is worth mentioning that the interview guide and questions can also be modified based on the actual research interview experiences (Taylor 2005, Holloway & Wheeler 2010).

In the fifth and last phase of the development, the researcher presented the finished interview guide. Presenting the actual interview questions in the study paper enabled the study results to be assessed in relation to earlier knowledge. This made it possible for other researchers to test and develop the guide further. Thus, the interview guide should be prepared so that other researchers could use it as well. For instance, excluding international study results from the literature review in the second phase of the development process could have hindered the universal use of the interview guide.

Developing a rigorous semi-structured interview guide enhances the trustworthiness of qualitative research in several ways. Observing the principles of Lincoln and Guba (1985), several phases of the interview guide development process contribute to the credibility, confirmability and dependability of the study (Figure 2). Credibility refers to accurate recording of the phenomena under scrutiny (Shenton 2004). Thus, appropriate and successful selection of the data collection methodology in the first phase is an essential basis for the credibility of the study results (Jensen 2008). Instead of this, the third phase highlights the communication of the central concepts and the interview questions,
Developing a framework for a qualitative semi-structured interview guide

indicating the success of how the research subject was operationalized. In addition, presenting the connection between the study phenomena and interview questions in the last phase allows reader to evaluate if the study actually measured what was intended (Shenton 2004). Confirmability of the study refers to the researcher’s objectivity (Lincoln & Guba 1985), something that a rigorous development process also contributes to in many ways. The subjective role of the researcher can be reduced using systematically collected literature-based and empirical previous knowledge. In addition, criticism gained through pilot testing contributes to the objective development of an interview guide. When a researcher writes a study report and presents a complete interview guide, they can express confirmability by making the research process as transparent as possible and by describing how the data were collected (Jensen 2008b). Dependability refers to repeating the study in the same conditions (Shenton 2004). Thus, presenting the complete interview guide in the last phase of the development process is linked to the dependability of the study, allowing availability of the data collection tool for the other researchers.

Limitations

The limitations of our study concerned the review method and the data collection process. As a review method for theoretical studies was not available, we adapted a review method for theories (Campbell et al. 2014). Due to the general nature of the search terms and the widely used method of semi-structured interviews, the identification and limitation of search terms was challenging. Because of the way that scientific databases are currently structured, it was impossible to focus literature searches on the methodological literature. Based on the classical strategy of literature searches – using a 10-year time period, searching all fields and using MeSH terms – we produced 143,919 results, which was too many to manage rigorously. Therefore, to identify a reasonable number of papers (N = 2,703), unusual limitations in the literature searches were used. Because it was not possible to limit the search in the databases to methodological papers, we had to manually separate the methodological papers from the empirical ones. This may have risked excluding some relevant papers from the review.

Conclusion

Our study shows that rigorous development of a qualitative semi-structured interview guide contributes to the objectivity and trustworthiness of studies and makes the results more plausible. However, this process has rarely been described in scientific papers, which hinders opportunity to assess the success of the study methodology. Researchers should consider proceeding systematically using five-step process in developing a semi-structured interview guide and justify the decisions made during it. Further research is needed to clarify: (1) how to collect empirical knowledge to complement previous literature-based knowledge, (2) how to formulate a preliminary guide and (3) how to derive the results from pilot testing into the form of a presentable, completed semi-structured interview guide.

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Conflict of interest

The authors have no conflicts of interest to declare.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/recommendations/)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

References


Environmental responsibility in hospital care: Findings from a qualitative study

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ABSTRACT

Objective: To identify the key elements of environmental responsibility in hospital care and the stakeholders involved.

Background: Hospital care causes a significant global environmental burden, which threatens human health and wellbeing. Environmental responsibility has been identified as an essential part of patient care with regard to health promotion and wellbeing of humans, but it has often been regarded as a secondary issue in hospitals. In addition, the lack of organizational structures and administrative as well as managerial support inhibit the promotion of environmental responsibility in hospitals.

Methods: We used a qualitative study with semi-structured interviews and document analysis. Our data was drawn from the environmental managers of five Finnish university hospitals and documents on their environmental programs.

Results: We found that the aim of environmental responsibility in hospital care was to avoid unnecessary emissions, and that it was guided by the authorities and by ethical values. It included targets for sustainable use of material, electricity, water and transport. Environmental responsibility required the involvement of several stakeholders, including administrators, environmental manager, immediate leaders, environmental support people, staff and patients. Implementation of environmental responsibility was promoted by collaboration, education, diverse initiatives to motivate staff, and continuously developing practices.

Conclusions: Environmental responsibility extended throughout a hospital organization. Staff was in a key position to implement it, but they needed versatile organizational support, including education, clear procedures, defined roles, and a motivational culture and facilities.

Implications for hospital management: This study yields new knowledge that will provide information for the development of organisational structures with respect to environmental responsibility in hospital care.

Key Words: Environmental manager, Environmental program, Environmental responsibility, Hospital, Key informant

1. INTRODUCTION

Previous studies have indicated that hospital care causes a significant burden on the environment.1 This burden refers to indirect emissions which are created by various activities carried out by staff working in diverse roles and departments, as they consume a wide range of medical products, foods, electricity, water, and transportation in hospital care.2,3 Staff indirectly contributes to global warming, as producing energy and materials, transporting4 and incinerating waste1 produce emissions, such as carbon dioxide, that contribute to climate change. These emissions accelerate global warming, which causes irreversible changes in ecosystems, such as drought and rising ocean temperatures.4 These changes then disturb the ecological balance. One consequence of

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this is that animal species who depend on certain environmental conditions have to seek another location when their original habitat is no longer suitable for them in order to survive.\textsuperscript{[5]} These kinds of consequences have already been seen around the world. As humans are dependent on ecosystem services, such as food production and fresh water resources, climate change is a serious threat for future generations, particularly in the areas close to the equator.\textsuperscript{[10]} One of the consequences of climate change is an increasing area of regions that are habitable to mosquitoes and the virulence of animal-borne infections, such as malaria.\textsuperscript{[5,6]} In addition to climate change, the chemicals used in hospitals, such as mercury and medicines, disturb organisms in local habitats and eventually end up in humans through food chains.\textsuperscript{[7]}

Controlling climate change and chemical emissions is central to environmental responsibility, which is based on ethical demands to protect people’s health and wellbeing on Earth.\textsuperscript{[8,9]} In hospital care, environmental responsibility has traditionally been regarded as a secondary issue that falls outside the core mission.\textsuperscript{[10–13]} However, it has been identified as an essential part of patient care from a health promotion perspective.\textsuperscript{[1,8,9,11]} and the role that healthcare professionals play in tackling environmental issues has been emphasized.\textsuperscript{[2,9,14]} Indeed, environmental responsibility refers to people’s behavior\textsuperscript{[3,4]} but it also includes the actions taken by organizations to protect the world around them.\textsuperscript{[14,15–17]} Environmental responsibility is also an important part of occupational wellbeing, as chemical control protects workers’ health.\textsuperscript{[11,18,19]} Health care has been identified as a “high-hazard” work sector because of the pharmaceuticals involved, such as anticancer drugs, sterilizing substances, and other substances used in various forms by its employees.\textsuperscript{[18]} In addition to the benefits presented in this paper, environmental responsibility has been proved to reduce expenses due to the reduced consumption of material and electricity.\textsuperscript{[20–23]}

Long-term strategic policies are required to promote environmental responsibility at an organizational level.\textsuperscript{[16,17]} An environmental program is a strategic organizational policy paper, led by the hospital’s senior management team, that defines the framework for systematically providing services without harming the environment.\textsuperscript{[17]} However, it has been reported that the use of these programs is not approached systematically in the hospital sector.\textsuperscript{[24]} Strategic work in developing environmental responsibility highlights the role that leaders need to play\textsuperscript{[25]} and the importance of collaboration between different stakeholders\textsuperscript{[9,17]} Some hospitals, for instance in Germany,\textsuperscript{[13]} have voluntarily hired environmental managers\textsuperscript{[26]} to oversee the strategic development of such policies and ensure that they are sustainable from an operational point of view.\textsuperscript{[25,27]} As they work in multi-professional teams with administrators and staff, they can provide a wider view of both technical solutions and sensible and realistic operations. They can also scrutinize the work of different stakeholders, including leaders’ and health care professionals’ such as nurses’ roles in organizational environmental responsibility. Environmental managers have been reported to contribute to organizations’ legal\textsuperscript{[27]} and profitable operations and represent the organization’s sustainable aims to their staff.\textsuperscript{[25]}

An increasing number of studies are looking at environmental responsibility in hospital care by observing different areas, especially waste management\textsuperscript{[19,28,29]} and sustainable activities in the operating theater.\textsuperscript{[20,23,30]} In contrast, very few studies have looked at comprehensive environmental responsibility in hospital organizations\textsuperscript{[9]} and have merely referred to structural skeletons that promote ecologically sustainable patient care.\textsuperscript{[9,16,17]} Therefore this topic had been chosen as the main focus in this study, which aims to identify the key elements of environmental responsibility in hospital care and the stakeholders involved. We conducted this research using information from environmental managers and programs in Finnish university hospitals. Our research questions were:

- What are the key elements involved in environmental responsibility in hospital care?
- What are the roles of the key stakeholders with regard to that responsibility?
- How can environmental responsibility be promoted in hospital care?

2. METHODS

2.1 Design

We employed a qualitative study design, based on a content analysis design, and used data triangulation\textsuperscript{[31]} in two stages (see Figure 1). In the first stage, we wanted to gain a diverse insight of the study phenomenon and we did this by interviewing the key informants,\textsuperscript{[32]} referring to experts who could provide a wide perspective on the study topic.\textsuperscript{[33]}

In the second stage, we completed the data by using document analysis\textsuperscript{[34]} on environmental programs. We followed a checklist produced by Tong et al. (2007),\textsuperscript{[35]} which provides consolidated criteria for reporting qualitative research.

2.2 Study setting

Our research settings were all five of Finland’s university hospitals as they provide the most highly specialized medical care in their catchment areas. All the other Finnish hospitals and health centers, municipalities and citizens are covered by these five university hospitals\textsuperscript{[36]} and they lead the network that provides healthcare for the entire Finnish population of approximately 5.5 million citizens.\textsuperscript{[37]}
Table 1. The semi-structured interview guide

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is environmentally responsible hospital care?</td>
<td>• What kind of factors does environmentally responsible hospital care consist of?</td>
</tr>
<tr>
<td>How is environmentally responsible hospital care guided inside and outside your organization?</td>
<td>• What are the roles and duties of different stakeholders?</td>
</tr>
<tr>
<td>What are your organization's targets for environmentally responsible hospital care?</td>
<td>• What potential do different stakeholders, such as nurses, have to promote environmental responsibility?</td>
</tr>
<tr>
<td>What are the challenges of environmentally responsible hospital care?</td>
<td>• What kind of research has been carried out on environmental responsibility in your organization?</td>
</tr>
</tbody>
</table>

Is there anything else you would like to add about environmentally responsible hospital care?

2.3 Recruitment and informants

We recruited a purposeful sample of all the five environmental managers (four male, one female) working in the university hospitals. They worked in technical departments and had different educational backgrounds in chemistry, engineering, horticulture and administrative sciences. After obtaining permission from the university hospital administrators, the researcher (HK) contacted potential participants by email and sent them information about the study, including its purpose and the fact it was voluntary to take part. All the environmental managers agreed to participate and the researcher (HK) arranged meetings with them by email.

2.4 Data collection

2.4.1 The interview data collection

We used a semi-structured individual face-to-face interview for the data collection. We built the interview guide (see Table 1) based on a literature review. We piloted the guide.
with one technical manager who was accountable for the environmental affairs of a central hospital and, based on this, found that the guide was intelligible, logical and comprehensive. The researcher (HK) conducted interviews at the participants’ offices or nearby meeting rooms. They lasted 7.5 hours in total (1.5 hours on average) and were recorded and transcribed verbatim to text for analysis. The researcher made field notes during and after the interviews, so that she could remember the documents a participant referred to and take notes of any points that the participants particularly stressed on during the interviews.

2.4.2 The document data

Our document data consisted of the environmental program policies of Finnish university hospitals. The environmental managers or their assistants provided the documents to the researcher in electronic form between October 2016 and January 2017. When they were printed, they produced a total of 86 pages of data. The length of the documents varied from 4 to 52 pages and their planned coverage ranged in duration from three to seven years. The duration was not reported in one of the documents. In one organization, the environmental program was integrated into the general responsibility strategy. This program included 11 pages and environmental issues covered approximately two pages. The main content areas in the environmental programs varied and are described in Table 2.

2.5 Data analysis

We conducted the analyses in two stages (see Figure 1) and used qualitative content analysis to create descriptive categories. During the first stage, we inductively analyzed the interview texts, to create categories for the document analysis. In the second stage, we deductively analyzed the document data, utilizing the categories formulated during the first stage. The data from the documents provided details on a number of areas (see Figure 2 and Table 3), such as energy saving practices. We began both the interview and document data analysis with a preparation phase that aimed to build up a picture of the whole texts. We chose to use meaning units of a sentence or part of it (see Figure 2). The next phase was to organize the data and this included extracting all the meaning units from the interview data. A researcher (HK) allocated codes to the participants and extracted their quotations from the transcripts. After this, she abstracted the interview data by manually grouping the parallel meaning units under representative sub-categories. HK and MK organized the sub-categories to form broader upper categories (see Figure 2 and Table 3). After we analyzed the interview data, we proceeded to organize the document data (see Figure 1). HK coded this data according to the categories identified in the interview data analysis. HK also analyzed the document data inductively, but this process did not identify any new themes. The sources of information are itemized in the Table 3.

<table>
<thead>
<tr>
<th>Content areas</th>
<th>H #1</th>
<th>H #2</th>
<th>H #3</th>
<th>H #4</th>
<th>H #5</th>
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<tr>
<td><strong>Energy efficiency</strong></td>
<td></td>
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<tr>
<td>• Construction and premises</td>
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<td>• Devices and lights</td>
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<td>• Logistics, transportation arrangements, commutes</td>
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<td>• Water use</td>
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<td><strong>Sustainable material use (including food)</strong></td>
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<tr>
<td>• Sustainable purchases</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>• Reducing consumption and waste</td>
<td>x</td>
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<td>• Waste management development (e.g. recycling)</td>
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<td><strong>Chemical control (including medicines)</strong></td>
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<td>• Cleaning chemicals and alternative techniques</td>
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<td>• Proper chemical disposal and sewage control</td>
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<tr>
<td>• Purchasing toxic-free products</td>
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<td><strong>Environmental collaboration</strong></td>
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<td>• Staff’s role and their education</td>
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<td>• Environmental leadership</td>
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<td>• Environmental support people network</td>
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<td>• External cooperation, partners and networks</td>
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<td>x</td>
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<tr>
<td>• Environmental communication</td>
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Table 3. Environmental responsibility in hospital care: themes and categories identified from interviews (i) and documents (d) in the analysis

<table>
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<th>Sub-categories</th>
<th>Upper categories</th>
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<td>Arranging education and information (i,d)</td>
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<td>Fostering intra-organizational collaboration (i,d)</td>
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<td>Fostering extra-organizational collaboration (i,d)</td>
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<td>Creating a positive atmosphere (i,d)</td>
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<td>Providing inducements (i,d)</td>
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<td>Addressing aims/indicators (i,d)</td>
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<td>Following the indicators (i,d)</td>
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<td>Assessing progress (i,d)</td>
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<td>Allocating interventions (i,d)</td>
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2.6 Ethics

We followed the research principles of integrity and honesty in this study. When we were planning the study, we ensured that the participants’ integrity was not at risk, and according to Finnish law, ethical committee approval is not needed if there is no risk. In addition, the participants took part in their capacity as professional environmental managers and not as private individuals. We obtained written permission from each university hospital science service center before we conducted the interviews. The researchers (HK) told the participants about the purpose of the study, stressed the voluntary nature of their participation, stated that they had the right to withdraw at any time and obtained written consent. The environmental programs were provided by the environmental managers or their assistants, and, as they were public documents, we did not need separate approval to use them. We have reported all the data anonymously. In order to protect the anonymity of participants, we have limitedly reported demographic data of them, and we have reported their quotations without codes.

3. RESULTS

Based on our analysis, environmental responsibility in hospital care included four main elements: (1) guiding principles, (2) targets, (3) the roles of the stakeholders, and (4) tools for implementation (see Table 3).

3.1 Guiding principles for environmentally responsible hospital care

Based on our analysis, two principles that provided the foundations for environmental responsibility in hospital care were authoritative tutelage and ethical values (see Table 3).

3.1.1 Authoritative tutelage

Authoritative tutelage consisted of national government policy and waste management orders from different organizations. National legislation guided sustainable development on a general level, but it was abstract and needed to be interpreted and contextualized by administrators. Also the aims of the European Union (EU) towards sustainable energy use were highlighted in an environmental program and, according to the EU regulations, the public sector is expected to set a good example in purchasing and energy efficiency. Waste management was the most frequently guided area of environmental responsibility in hospitals, as the waste management and pharmaceutical companies, municipalities, the National Supervisory Authority for Welfare and Health, and the EU all instructed hospitals at various levels.
Thinking in a westerner way, we should provide a lead. . . we were preferred over disposable ones, but guidance would be wash a product rather than dispose of it. Washable textiles included intangible wares such as renewable energy forms and different services.

“Literature guiding the selection between re-usable and disposable products is sparse.”

The main aim for sustainable material use was minimizing waste. For example, medical product waste could be minimized by limiting unnecessary orders and preventing products expiring. Avoiding product contamination also decreased waste. In addition, opened or expired sterile products could be used for non-sterile activities.

“In patient care, some staff members use to take all kinds of bandages and gauzes to their patients’ rooms just in case. . . we should only use what is necessary.”

Organic food waste could be reduced by using standardized menus and sectional food preparation in hospital kitchens. On the wards, organic waste was avoided by maintaining updated food orders for patients. It was crucial to investigate the real sources of food waste and there should be focused interventions to help reduce waste. Suggestions to avoid paper waste included developing electronic programs, services, and learning environments, double-sided printing and only printing updated pages rather than whole documents. To avoid furniture waste, permanent office furniture was purchased and reused for other purposes when no longer required.

Sustainable material use included the systematic control of risk materials, namely hazardous waste, chemicals, and toxic materials. The best practice to prevent toxic waste was to minimize buying hazardous substances, including PVC. When disposing pharmaceuticals and dangerous materials, they needed to be packed and stored properly, and shipped for appropriate disposal. It was reminded that pharmaceuticals should never be released down the drain or to landfill where they could end up in groundwater. It was moreover important to adulterate detergents according to the instructions.

The effective use of electricity included using energy-effective technology and architecture in hospitals. Use of automated devices was found to decrease the consumption of electricity. For example, automated air conditioning units could keep the temperature at an optimum level, which achieved an effective use of electricity, but they required expertise to adjust the settings. It was also suggested that fluorescent lights and light-emitting diode lamps could help to decrease the consumption of electricity. The routines and daily use of different devices and lights had a notable effect on electricity consumption in patient care. This referred to avoiding using medical devices unnecessarily and not keeping them switched on or standby. This also included avoiding

3.1.2 Ethical values

The ethical values that guided environmental responsibility were social responsibility, good care, and professionalism. Social responsibility referred to securing the wellbeing of citizens, society, and future generations. Hospitals were large and public institutions and they were seen to act as role models and forerunners in decreasing carbon footprints.

“Thinking in a westerner way, we should provide a lead. . . we pretty well conceive our own mistakes and those shouldn’t be replicated in developing countries.”

In addition, having a good reputation for environmental responsibility was considered to be beneficial for employee recruitment and marketing for patients. Good care particularly referred to ensuring asepsis when making environmental improvements. As a guiding ethical value, professionalism referred to the staff’s individual decisions in their daily work. For example, they were able to select between reusable and disposable items and to decide whether to sort their waste or not.

3.2 The targets for environmentally responsible hospital care

According to our analysis, the targets for environmental responsibility in hospital care were the sustainable use of materials, effective use of electricity and water, and optimized transportation (see Table 3).

3.2.1 Sustainable use of all material

The sustainable use of material included considering purchases, waste and risky materials. Hospitals’ buyers were able to decrease the environmental impact by making justified purchase decisions. This included assessing the total environmental impact of the life-span of an item, from the raw material acquisition to disposal. The life-span assessment was found to be highly challenging because of long and multidimensional delivery chains. Buyers’ decisions also included considering the total ramifications before changing to a new product. One quoted example was switching to a different copy paper that had caused unexpected problems with the printers. One solution to promoting sustainable purchasing was to centralize procurement between the hospital departments. Sustainable material use also included considering the safety, durability, recyclability, and reusability of a product. Recycling was considered crucial, because using recycled materials requires less energy than using new raw materials. Reusability referred to whether it was possible to wash a product rather than dispose of it. Washable textiles were preferred over disposable ones, but guidance would be needed for other products. Sustainable purchasing moreover included intangible wares such as renewable energy forms and different services.

“Literature guiding the selection between re-usable and disposable products is sparse.”

The main aim for sustainable material use was minimizing waste. For example, medical product waste could be minimized by limiting unnecessary orders and preventing products expiring. Avoiding product contamination also decreased waste. In addition, opened or expired sterile products could be used for non-sterile activities.

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The effective use of electricity included using energy-effective technology and architecture in hospitals. Use of automated devices was found to decrease the consumption of electricity. For example, automated air conditioning units could keep the temperature at an optimum level, which achieved an effective use of electricity, but they required expertise to adjust the settings. It was also suggested that fluorescent lights and light-emitting diode lamps could help to decrease the consumption of electricity. The routines and daily use of different devices and lights had a notable effect on electricity consumption in patient care. This referred to avoiding using medical devices unnecessarily and not keeping them switched on or standby. This also included avoiding
the use of unnecessary electronic lights during the day. However, it was noted that traditional fluorescent lights can be damaged if they are switched on and off too often. This highlighted the need to ensure that the staff was instructed in the correct use of technology. “Over one third of the hospital’s electric costs goes to light-ning, so there is a lot to do in it!” “All the examinations with this device are carried out in less than one hour, but despite that, it is turned on all day long!”

3.2.3 Effective use of water
The effective use of water was linked to energy consumption. The main factor was choosing and maintaining modern water saving taps, toilet seats, and kitchen equipment. It was noted that carelessness and leaky sanitary wear often increased water consumption in hospitals. In addition to technological solutions, daily routines affected water use and staff should avoid leaving water running and washing textiles unnecessarily. Administrative alignments referred to hospitals’ policies and reducing the periods of treatment with day surgery or shorter surgery. “In an emergency, they (staff) give patients hospital clothes to wear, even if they could wear their own (referring to unnecessary use of hospital clothes, which increases consumption of water in textile washing).”

3.2.4 Optimized transportation
Optimized transportation promoted sustainable energy use and reduced emissions. With regard to patient care related material transports, hospitals had used firms with environmentally friendly equipment, fuel, and driving patterns. The use of software to calculate optimized transport routes, as well as shared transport with other institutions, enabled them to avoid unnecessary journeys. Furthermore, delivering frozen food to the wards decreased the frequency of journeys and food waste. With regard to passenger traffic to the hospitals, good public transport with warm places to wait and real-time screens providing updated information about buses decreased the usage of private vehicles. These improvements also promoted safety and clean air in the areas surrounding the hospitals. To reduce motoring and thus hospital-related emissions, the staff was encouraged to commute actively to work, for example by walking or cycling. Arranging collective taxis and using tele-medicine services also cut the number of patient journeys. “It would be unreasonable to deliver one item here and one there. Thus, material deliveries into our hospital’s center warehouse are always conducted by the collective transports with the other institutions of the city.” “Our traffic center arranges collective transports for patients.”

3.3 Roles of the stakeholders in environmentally responsible hospital care
Based on our analysis, environmental responsibility in hospital care required the involvement of six groups of stakeholders: administrators, environmental managers, immediate leaders, environmental support people, staff, and patients (see Table 3).

3.3.1 Administrators
The administrator’s role in environmental responsibility was to oversee and support the environmental program and to make regulatory decisions when environmental aspects were considered, for example in investments. They had a responsibility to create a framework for environmental work in an organization and, for example, to appoint a committee with an environmental manager or managers and sufficient resources to operate. The strong and visible commitment to environmental responsibility required from administrators was highly emphasized in the data, as they were the key people who created a positive culture towards environmental responsibility. “It is brilliant that our administration supports environmental work. Otherwise we wouldn’t have any progress.”

3.3.2 Environmental manager
The environmental manager’s role was to develop and coordinate environmental affairs in an organization. They formed environmental programs and assessed and reported on achievements. They prepared and presented environmental issues to the administration personnel, created and updated general guidelines and arranged education and information for staff. The environmental manager acted as a link between the administrative personnel and the staff, and played a key role in the development and promotion of environmental responsibility. “We (environmental managers) are also support services and help people to work (responsibly).”

3.3.3 Immediate leaders
Immediate leaders referred to the managers close to the staff, such as head nurses on the wards. They were responsible for the environmental performance in the hospital departments. This included nominating environmental support people and providing comprehensive guidance on the processes, so that environmental elements became integrated into the staff’s working practices. Their duty was to involve the staff by leading shared discussions and decisions and managing workshops to decide how to apply the organization’s strategic priorities to create practical solutions. Their
3.3.4 Environmental support people
The environmental support people were nurses and other professionals who were nominated and educated to facilitate environmental practices in their departments. Their duties included investigating ward-specific waste and creating department-specific instructions and practices for sorting and recycling. In addition, they were intermediaries between ward-level practice and the managerial level, informing staff, leaders and an environmental manager about what their wards needed and what changes were required to achieve that. Having a network of support people in a hospital was seen as a tool for shared knowledge and practices in environmental issues. Their approachability and position as part of a work community in departments were considered beneficial.

“People in a hospital department may contact people more easily, if someone familiar is taking care of environmental issues.”

“In many places the environmental support person is a nurse. This is an extremely good thing because they have credibility in their work community.”

3.3.5 Staff
The role of staff, particularly those working close to patients, was considered fundamental in achieving environmental responsibility in hospital care practice, because they were considered central in minimizing the use of materials, water and electricity. Participants also brought up the staff’s potential to avoid hospital-related emissions by commuting with public transport or biking instead of driving. They also highlighted that the staff is in a key position to highlight practical opportunities for environmental improvement. Participants emphasized a particular challenge in achieving environmental responsibility in hospitals, namely getting the commitment of staff, especially physicians. They linked not committing to such attitudes that environmental responsibility was meaningless and that people were indifferent to the environment.

“Attitude is a great challenge. I guess there is nothing greater.”

“Some people do not think that this is a common good and they do not care about it.”

“I went to a leading doctors’ meeting and environment was the last issue... and half of the doctors marched out.”

3.3.6 Patients
Participants mainly highlighted the patients’ role in environmental responsibility in avoiding driving to medical appointments in order to avoid hospital-related emissions. Participants also stated that patients could sort out waste and use water sparingly in the shower.

“It is irrational to build enormous parking garages in hospitals. Instead, it is important to have good public transport connections.”

3.4 The tools for implementing environmentally responsible hospital care
Our analysis suggested that there were four types of tools for implementing environmental responsibility: multi-professional collaboration, educating staff, motivating staff, and continuous practice development (see Table 3).

3.4.1 Multi-professional collaboration
Multi-professional collaboration was perceived as a tool for sharing expertise and extending environmental practices to all parts of patient care. On an intra-organizational level, administrators established environmental groups to develop environmental strategies and these brought together different professionals and departments. It was important to engage the expertise of nursing professionals, physicians, cleaning and transport services, technical departments, pharmacies, and the hospital’s communication and media department in decision-making. In addition, collaboration with hygiene experts was important in order to ensure that the environmental adjustments did not threaten asepsis.

“The hygiene department arrange training and visit hospital units, providing a kind of invisible support. If I built an organization, I would put environmental issues and the hygiene department together.”

On an extra-organizational level, the initial work on how to use and share knowledge was carried out with different consultants and designers, particularly with regards to construction and logistics. Collaboration with municipality and governmental officers was also conducted when designing waste programs, along with different waste treatment agencies concerning the transportation and incineration of waste. On top of that, other public services and healthcare organizations were contacted to share knowledge and develop consistent environmental practices between the hospital districts. The Association of Finnish Hospital Engineering proved to be a central forum in this regard.
3.4.2 Educated staff

Educating the staff was a key tool for implementing environmental responsibility in a hospital. Education comprised of focused training and improving general awareness. The latter included easily accessible Internet guidelines, emails, regularly distributed fact sheets, leaflets, brochures, stickers, campaign posters, exhibitions and interactive information sessions. In addition, introducing new employees and students to environmental practices was highlighted.

“Our nurses come from a university of applied sciences and it is important to get the message about environmental responsibility out there.”

“There should always be at least one short practical lesson on sustainable development during medical education.”

Information should be up-to-date, justifiable, easy to understand, visual, and interesting. Staff had particularly liked campaigns with a humorous character and concrete energy consumption volumes. Hospital canteens were considered particularly suitable places to spread general information. Focused training mainly referred to educating environmental support people. When conducted regularly, this was an effective way to update practices in the various departments. Focused training included environmental managers’ visits to different hospital departments, which was popular because it enabled department-specific training to be given to staff. Environmental managers also found these visits beneficial enabling them to maintain their touch on practice. Training for hospital support services was also mentioned, namely for the staff who provided purchasing, catering, and transport services.

3.4.3 Motivated staff

Motivating staff was considered to be the tool that strengthened the continuity of pro-environmental behavior. Staff motivation had been promoted by providing them functional and meaningful facilities, particularly for waste management. For example, it was seen beneficial to remove and sort extra packing material before delivering medical products to patient care departments.

“If sorting different wrapping materials requires a lot of effort from nursing staff or doctors, then it is a bad thing. The work environment should automatically guide you to sort waste.”

Immediate leaders and environmental support people also played a key role in motivating staff by presenting environmental issues in a positive way. In addition, different inducements were considered as a way of promoting staff motivation, such as rewarding staff for their environmental progress.

“Getting publicity for progress could help other people to become interested.”

The importance of variously promoting environmentally-friendly commuting was highlighted. The use of public transport was supported by offering free tickets for the staff and arranging functional bus connections to the hospital. The staff was also motivated to cycle by providing proper shower facilities, bicycle tracks, locked storage, and free annual bicycle maintenance. In addition, a light-hearted communal contest at one hospital had motivated staff opt for cycling. To reduce unnecessary travelling, people were encouraged to work from home when possible.

3.4.4 Continuous development

Continuous development of practices was a tool to ensure that the methods of executing environmental responsibility in a hospital remained up to date. The importance of measuring environmental work to enable objective analysis of development was highlighted.

“I think measuring progress is essential in everything. If we don’t measure it, we can’t discover what we have gained.”

It was crucial to set realistic and measurable aims for reducing consumption, purchasing, transportation and, for example, the amount of environmental support people and training hours. The aims were both numeric targets and time frames, were addressed every few years, and were often published in environmental programs. Realistic aims were defined as being both sensible and practical, as they enabled detailed follow-ups and effective interventions. For example, electricity and water consumption was building-specific and material consumption and waste generation was department-specific. Thus, the information was beneficial for all the stakeholders. Results in achieving organizations’ aims were evaluated periodically and used to set targets for the next evaluation period.

4. DISCUSSION

4.1 Scrutiny of the results

Our study provides an organizational insight into environmental responsibility and how it is promoted in hospital care. According to our results, environmental responsibility was based on national and international guidelines by authorities and ethical values of social responsibility, good care and professionalism. The targets of environmental responsibility were the sustainable use of materials, effective use of electricity and water, and minimized traffic. Putting environmental responsibility into practice required the involvement of six groups of stakeholders. The administrators’ role was to oversee and support the realization of the environmental program as well as responding to regulatory decisions. The
environmental managers’ role was to develop environmental issues, such as planning and evaluating environmental programs and education. Immediate leaders were responsible for guiding environmentally responsible practices in the hospital departments and environmental support people provided the expertise to facilitate them. It was the staff’s duty to execute environmental responsibility according to given guidelines. In addition, patients could participate in environmental responsibility by minimizing the environmental harm resulting from their treatment period. The implementation of environmental responsibility could be promoted by multi-professional collaboration, education and motivation for the staff, and continuous development of practices.

The findings in our study highlighted the fact that there are two particular areas of environmental responsibility in hospital care that need to be addressed to make any environmental programs a success. They both deserve closer scrutiny. Firstly, working towards environmental responsibility required systematic and committed leadership. Administrators have a key role in leading initiatives because without their contribution hospital staff is less likely to act responsibly.[12,42] In addition to providing resources, it is an administrators’ duty to clearly define roles in the organization to help people recognize their responsibilities and to stop them from passing them on to others. Administrators need to perceive sustainability as an inseparable basis of patient care and support people’s endeavors with environmental managers leading the way.[26] It is not possible to separate hospital care and environmental responsibility as they have a bidirectional relationship: hospitals contribute to the environmental burden due their consumption, and diseases that are caused by climate change are treated in hospitals.[1,5] This is why administrators should seriously consider integrating environmental goals into their organization’s general strategy.[43]

Secondly, our findings underlined the need to engage all hospital staff in pro-environmental behavior and this point was in line with earlier studies.[24] Engaging nursing professionals is particularly crucial, as they have wide opportunities to minimize unnecessary consumption, and physicians, who can avoid unnecessary treatment days. Recent studies have reported that nurses saw pro-environmental behavior as secondary to other job requirements[12,15] and even the term health care professionals’ environmental numbness has been used.[10] This has been explained with medical procession, along with which health care professionals have increasingly concentrated on patients’ immediate needs rather than preventative scope including protection of environmental health.[44] In a globalized world, however, sustainable procedures are a necessary characteristic of patient care.[44] Along the topicality and general debate of climate change, health care professionals have become more aware of their environmental burden. Despite of this, recent study has reported that nurses seldom expressed pro-environmental attitudes because they were afraid of conflict and stigmatization among their work communities.[12] This supports our findings of the need for strong environmental leadership and culture in hospital organizations.

We found that engaging staff in pro-environmental behavior can and should be promoted using several methods. In line with earlier studies, education plays a key role[2,45] and educating health care professionals has been found to produce clear improvements in waste management.[29] Education should not be limited to just waste issues. The wider topic of environmental responsibility should be included in nursing and medical curriculums to help health care professionals to understand the connection between their practices, resource scarcity and climate change.[2,45,46] Information needs to be up-to-date,[16] usable, interesting, reasonable and easy to understand. This relates to both formal and in-service training.[45] Also guidance given to the staff from different sources must be consistent. For example, the staff may be advised to turn off devices, but computers may need to be left on because of software updates. Therefore, official instructions need to be formulated through multi-professional collaboration before being disseminated to staff.

Based on a recent study, it is possible to improve people’s attitudes towards sustainability with education.[45] This is encouraging, as in our data and earlier study,[10] staff’s attitudes were considered to be a substantial barrier to progress in environmental responsibility. On the other hand, another study[47] found that a pro-environmental attitude was not necessarily required, as favorable work structures, systems, cultures and rewards, and staff’s awareness of practical sustainable actions, may already be enough to change their behavior. This supports our findings about the need for diverse organizational support in environmental work. In addition to receiving education, people also need to be motivated to behave in an environmentally friendly way[14] by other approaches.[16] Administrators could, for example, give work communities feedback on their performance[29] and reward their success financially.[43,47] and publicly. Also, a sense of community motivates people to act pro-environmentally,[38] particularly if it benefits their private life.[49] A strong and visible sustainability culture and environmental collaboration in an organization promote joint responsibility and staff engagement. One way of signaling the importance of staff’s commitment to sustainability objectives, is to express them as early as during the recruitment stage.[43]

It is clear that leadership and staff engagement are tightly
We strengthened the evidence using data triangulation. Our participants emphasized the importance of common discussions and agreements in hospital departments. Environmental faults and aims should be discussed as well as the other topics in patient care and the departments’ leaders should play a central role in making this happen. Staff and department leaders need to be well aware of their organization’s environmental policy. Also setting concrete targets was highly emphasized in our data. It is necessary at an organizational level, with regard to the environmental work and program, but also at the practical grass roots level where initiatives are put into practice. Health care professionals need to have a clear understanding of the specific needs of why, what and how to carry out environmental initiatives. They must be able to implement their duties with profound knowledge, helpful leadership, inspiring team spirit, and proper resources.

4.2 Trustworthiness of the study

The central question regarding the trustworthiness of our study concerned the small sample and, therefore, its dependability. We considered it important to pursue homogeneity for the consistency of data and focus on the most advanced health institutions. The university hospitals were the only hospital network with official environmental managers. On the other hand, we reached data saturation in the interviews, as participants described the same contents when they discussed the categories developed during the analysis (see Figure 2). The preliminary analysis was sent to the participants for their comments but they didn’t add anything. We strengthened the evidence using data triangulation. The interview guide, data analysis, and research report were produced in close collaboration and discussion between the research group members, carefully considering the influence of preconceptions and other possible biases. The data was collected by the researcher HK, who was a masters-student. She had earlier experience of interviewing research participants with a semi-structured technique and of working as a nurse and an environmental support person in a university hospital department.

4.3 Implications for hospital management, knowledge development and education

This study has important implications for hospital management as it offers an organizational framework and beneficial tools for planning and developing structures for environmental responsibility in a hospital. Carrying out this qualitative study was also very necessary in helping to develop knowledge on this subject. The findings can be used as the basis for further research and quantitative studies, for example when developing more specific frameworks in different fields of patient care. Furthermore, this framework could also be used to help educate health care professionals.

5. CONCLUSIONS

Environmental responsibility extends throughout hospital organizations, from administrative and technical departments to patient care units. Health care professionals play a key role in minimizing unnecessary consumption on a daily basis, but they cannot achieve this in isolation. Instead, hospital administrators and department managers need to support them, so that environmental responsibility becomes an intrinsic part of patient care. If implementation of environmental responsibility is the tip of the iceberg, then there are various supportive factors that are needed beneath the surface, including clear organizational aims and strategies, clear descriptions of roles, procedures and guidance, proper facilities, and motivational factors. Hence, the key element in environmentally responsible hospital care is strong leadership and its ways of achieving diverse engagement. Environmental responsibilities are constantly changing and evolving and hospital management need to develop strategies that respond to them in an effective and inclusive way. In this study, expert interviews and program documents helped to identify environmental responsibility in a hospital organization. In future, more knowledge is needed about hospital managers’ and health care professionals’ experiences about effective implementation and engagement practices.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

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Nursing practices cause a notable environmental burden. This qualitative study examined environmental responsibility in nursing in hospitals, its theoretical background, targets, stakeholder roles, and implementation. Five phases of a semi-structured interview guide development process were identified to ensure a rigorous study methodology. The study shows that environmental responsibility in nursing requires supporting structures, including staff training, certain resources, and guidance.