Reflecting on environmental sustainability in management and organisation of healthcare

Growing environmental sustainability as part of daily practice in an emergency department

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Statement of Originality

I, Elaine Pei-Jing Xiao-Wei van Ee (598691), herewith declare to have written this document and that I am responsible for its content. I declare that the text and the work presented in this document are original and that no sources other than those mentioned in the text and its references have been used in creating it. Erasmus School of Health Policy & Management is responsible solely for the supervision of the completion of the work, not for the content.

Preface

Writing this thesis has been a remarkable journey for me. Working in the emergency department of the LUMC, conducting interviews, participating in the Sustainable Hospitals Lab, visiting van Straten Medical, attending workshops and lectures, and acting as moderator in the "Round Table" discussion, I learned many things about sustainability, organisation of healthcare and was inspired by the many people with whom I had the privilege of interacting. While taking the photos for my photo journal, I never thought this would become such a wonderful experience. On the second of June, I even had the chance to present these photos at the Dutch North Sea Emergency Medicine Conference in Egmond aan Zee. Moreover, in the coming months, I will share them with many hospitals in the Netherlands, which I hope will increase the attention and number of new initiatives that will further the cause of hospital sustainability.

I want to thank Pleuntje for all you taught me about the beauty of action research and the concept of reflexive spaces. In addition, I want to thank the LUMC, especially the emergency department, for facilitating my research. Thank you, Jeroen van Roosmalen for all the energy you gave me and for allowing me to present my photos at the Dutch Emergency Congress in Egmond aan Zee. Also, I am grateful to Maria Koijck, whose artwork and example of a strong woman greatly impressed, and motivated me, convincing me of the importance and urgency of reducing waste in medical settings. I would like to thank the Sustainable Hospitals Lab and Medical Delta organisation for including me as part of your research group and for teaching me so much about sustainable hospitals. Moreover, I am very thankful to all interviewees and the others who made time to help me with my research; without you, my research would not have been possible.

It is my hope that you will enjoy reading this thesis and that it serves as food for thought to develop new initiatives to make the emergency department, and the hospital, more environmentally sustainable. Thank you.

Kind regards,
Elaine van Ee

Abstract

Due to a lack of financial resources, time constraints, and people's mindset, the current state of awareness about environmental sustainability is relatively low in hospital emergency departments.

Considering the fact that the healthcare sector is responsible for seven per cent of the national CO_2 emissions, it is important that all departments in hospitals in the Netherlands take action to reduce their environmental impact. There has been relatively little research focused on environmental sustainability in emergency departments. The author of the research described in this thesis works in the emergency department at LUMC and, seeing the amount of waste generated every day, inspired her to focus her master thesis on this subject.

The goal of the research described in this thesis was to document, through qualitative research, photo-journaling, and keeping a reflexive journal, the amount of waste generated in the emergency department at LUMC. In doing so, it became clear that while there have been several sustainability initiatives in the emergency department, they have not been effective. Because the emergency department functions as a crisis-oriented department, it is difficult for nurses, doctors, and supporting staff to dedicate time and efforts to implement new sustainable initiatives. In addition to this, financial resources and technologies have not been allocated to sustainable initiatives.

Through the use of the reflexivity method employed in this research, it became clear that sustainability was not a priority for individuals working in the healthcare sector. Therefore, the aim of this research was to change this by raising awareness, of these individuals, through photo dialogues. Recognising that cooperation between many different actors is essential to bring about meaningful change in the daily working system, as many people as possible who were involved in the day-to-day operations of the department, such as the cleaning services and facilities management, were included.

To further highlight the importance of sustainability, the cost savings that can be realised through sustainable initiatives should also be emphasised and a point person to initiate and maintain continuous one-on-one dialogues with all the individuals involved should be appointed.

Table of Contents

Chapter 1 Introduction

1.1 Background

The World Health Organisation (WHO) describes the importance of health systems to achieve and maintain societal health and welfare, which are critical factors for development and economic growth (World Health Organisation, 2017). Seven per cent of the national emissions of CO_2 in the Netherlands is caused by the healthcare sector (Ossebaard et al., 2021; Romanello et al., 2021).

The definition of sustainability changes constantly and comprises facets of all sustainability policies, including human, economic, and environmental facets (Marimuthu & Paulose, 2016; Molero, Calabrò, Vignes, Gouget, & Gruson, 2021). According to the WHO (2017), an environmentally sustainable health system means: "*a health system that improves, maintains or restores health, while minimising negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations.*" In this research, *environmental sustainability* will be defined as the above, following WHO (2017), while referring to it as 'sustainability' or 'sustainable healthcare'.

Lack of awareness and/or knowledge regarding sustainability is a commonly described barrier to implementing sustainability in healthcare (Molero et al., 2021). During an interview, the director of Monash Sustainable Development Institute mentioned that people often think disposable protective and medical equipment is safer than reusable equipment. He disproves this argument because it has been standard practice for this equipment to be sterilised and reused (Ngo, 2020). As only 15% of hospital waste is hazardous and 85% is non-hazardous, reductions could most easily be performed in this 85% non-hazardous hospital waste, according to Ngo et al. (2020).

Another research conducted through a survey across four Mayo Clinics in the United States illustrated that 57% of those surveyed hospital staff is not aware of which items can be recycled, 39% seldom or never recycles, and 48% mentioned a lack of knowledge about recycling in those clinics (Azouz et al., 2019). Through spreading knowledge and awareness about reducing waste to reach lower climate impact, waste reduction initiatives can be inspired and performed, which can lead to a 45% to 80% reduction of waste, which entails savings of up to €65.000 annually (Cockerham, Haverland, & Solvang, 2016; Kleber & Cohen, 2020). Research from

the National Health Service England illustrated that a knowledge gap currently exists in the provision of environmentally sustainable care in the ED and points to the importance of developing examples of sustainable clinical practice (Spruell, Webb, Steley, Chan, & Robertson, 2021). The research of Spruell et al. (2021) also mentioned that a positive culture change is needed to adapt 'climate-smart' practices in the ED with research and development of new sustainability initiatives to protect the environment and health of patients. Therefore, this thesis will complement existing scientific research because of its application for the ED to potentially reduce the knowledge gap of environmentally sustainable care in the ED while developing examples of sustainable clinical practice and actions.

The societal relevance of this thesis is to improve the sustainability of the ED while maintaining good quality care, possibly while learning and implementing sustainable actions from elsewhere in the LUMC and beyond. To ameliorate sustainability in and around healthcare, it is of utmost value to address the problem at the management and organisation level of healthcare. Moreover, it might be helpful to implement guidelines and protocols that need to be followed by healthcare professionals and other hospital personnel and involve all persons and groups required to raise awareness about sustainability in the ED (Tricco et al., 2013). This research will focus on improving environmental sustainability at the ED of the LUMC, ultimately seeking to generate knowledge that could be implemented at more EDs in the Netherlands.

Furthermore, this research aims to increase awareness about sustainability in healthcare and the importance of acting on the need to become more environmentally sustainable. Applying reflexive spaces might be a practical approach. Reflexive spaces are virtual or physical forums where people can have reflexive dialogical practice (Cunliffe, 2002). This reflexive dialogical practice is used in learning processes where people are brought together and reflect on current needs in work practice, challenges, and adaptations (Wiig, Aase, & Bal, 2021). These reflexive spaces may offer a way to create awareness and think critically about sustainability. Thereby, the hypothesis is that when reflexive spaces are created in the management and organisation of a hospital, implementing environmental sustainability in daily practice can be easier achieved.

1.2 Objective and research questions

This thesis aims to improve environmental sustainability in the emergency department. The research will take place in the emergency department of the LUMC, although lessons learned from elsewhere will be taken into account. Therefore, the research question is embedded in sustainable hospital research whilst answering: "*How can the emergency department become more environmentally sustainable?"*

This research question can be divided into the following four sub questions:

1. What is the current state of awareness of environmental sustainability in hospitals, and specifically in the emergency department?
2. Who is involved in raising awareness about environmental sustainability in the emergency department?
3. What environmentally sustainable actions have already been taken in the LUMC?
4. How can reflexive spaces contribute to improving environmental sustainability in the emergency department?

1.3 Thesis outline

This thesis will have a general structure of five chapters. After this first introductory chapter which sets out the problem analysis and provides a context, the second chapter outlines the theoretical framework that should help frame the study and ensure it is based on empirical grounds. This is followed by chapter three, on the methodology used for this study and the actors involved. Chapter four will look at the findings of the interviews and the photo dialogue. Finally, chapter five will discuss the results, in the context of previous empirical research, drawing a conclusion, offering some reflexive researcher thoughts and stating recommendations for further research in this area.

Chapter 2 Theoretical framework

During this chapter, the thesis questions will be addressed as follows: 1) what is the current situation of environmental sustainability in healthcare and generic knowledge about healthcare, 2) who is involved in creating awareness, 3) how can more awareness be created, including ideas for environmentally sustainable actions and its necessary vital actors, and 4) how can reflexive spaces contribute to improving environmental sustainability. The following concepts, models, and theoretical perspectives will be used as 'lenses' through which this research will be performed and evaluated. Combining sub question one on the current state of awareness and two on actors involved in creating awareness, in section 2.1, the theoretical concepts and findings on sustainability in healthcare; combining sub questions two and three, in section 2.2, the role of hospital staff in creating awareness; and finally, sub question four in section 2.3, the concept of reflexivity and its reflexive spaces.

2.1 Sustainability in healthcare

There are significant gaps in the evidence base on sustainability in healthcare (McGain & Naylor, 2014). Sustainability can be described as a process that continues for the distant future without exhausting natural resources or damaging ecosystems (Schroeder, Thompson, Frith, & Pencheon, 2012). Research has been conducted on the amount of waste that hospitals produce, procurement in hospitals, behaviour by hospital staff around waste, designs of environmental-friendly hospitals to save energy and water, and the influence of hospital travel on the environment (Bruin, Houwert, & Merkus, 2019; Schroeder et al., 2012; Verderber, 2010). For example, twenty-two per cent of CO_2 emissions due to healthcare is related to hospital travel (Bruin et al., 2019). Another cause of the high percentages of CO_2 emissions in healthcare is plastic pollution, which can partly be solved via recycling medical plastic (Joseph, James, Kalarikkal, & Thomas, 2021). However, due to difficulties in sorting and cleaning this medical plastic, medical plastic recycling is limited (Joseph et al., 2021).

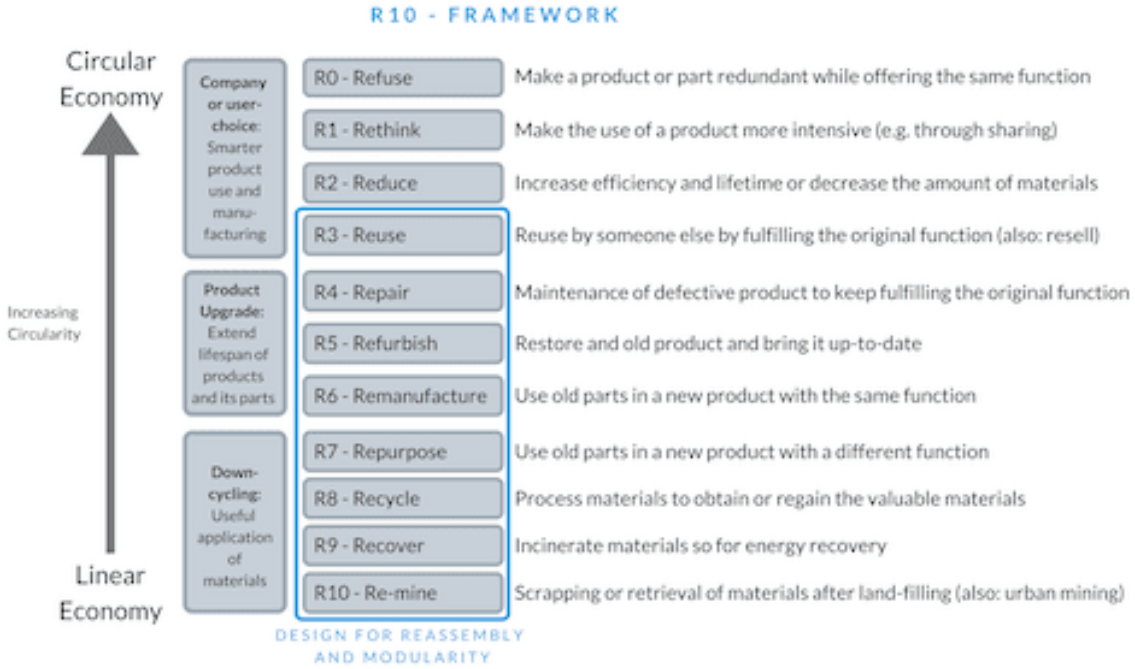
For this research, awareness of these high percentages of CO_2 emissions in the management and organisation of healthcare (Kleber & Cohen, 2020) could be related to the 4 R approach, mentioned by Friedericy et al. (2020), which entails refusing, reducing, reusing, and recycling waste, focusing on short loop retention options. In addition to the 4 R approach, the 10 R approach also focuses on remanufacturing, refurbishing, and repurposing. An overview of the 10 R approach can be seen in figure 2.

These two approaches of typology work together to maximise value retention, even when resources may be depleted (Reike, Vermeulen, & Witjes, 2018). The research about the 10 R typology, also mentions that there are controversial ideas regarding the circular economy to sustainability. The circular economy can be seen as a concept where economic and environmental sustainability is united. At the same time, the Dutch Government focuses more on the social dimension of sustainability while balancing the dimensions of value creation for people, nature, and the economy (Circular Academy, 2022).

When healthcare workers are more aware of the negative environmental consequences of waste produced in healthcare, unnecessary packaging will be avoided, and CO_2 emissions can be reduced (Friedericy, Beelen, Eijk van der, & Jansen, 2020). Implementation of the 4 R and 10 R approach, mainly repairing, refurbishing, and recycling, may lead to a more circular healthcare economy, which means that less waste is produced, and hospitals will save on waste costs (van Straten, Dankelman, van der Eijk, & Horeman, 2021). Research by Straten et al. (2021) illustrated that three Dutch hospitals, Maasstad, Haaglanden MC and VUmc, might gain €39.184 together through reusing discarded hospital instruments and stainless steel waste. Building on the definition of the WHO, sustainability in the ED in this research is seen as preventing excessive waste production and preventing people from going to the hospital in the first place (Ngo, 2020; World Health Organisation, 2017).

Figure 2

Overview of the 10 R approach (Rombouts, 2020)



2.2 Role of hospital staff in creating awareness

In the healthcare sector, there is a variety of single-use plastics (Joseph et al., 2021; Kleber & Cohen, 2020). A more sustainable healthcare sector could be designed when hospital staff, including management and organisation of healthcare, give more attention to the type of plastic, the recyclability, and the correct sorting, to create more awareness around sustainability among healthcare workers (Joseph et al., 2021). Research shows insufficient knowledge among healthcare professionals, about the importance of sorting medical plastic waste at the source of origin (Joseph et al., 2021; Kleber & Cohen, 2020). The importance of sorting this waste at the workplace is that it will enhance the efficiency of the recycling process chain, especially when nurses are also committed to recycling because they are the largest workforce in healthcare (Joseph et al., 2021; Kleber & Cohen, 2020). In addition, preventive medicine is vital to ensure a more sustainable healthcare sector because if care is not needed and thus not given, healthcare waste is prevented (Kleber & Cohen, 2020; Philipsborn et al., 2021). To conduct good preventive medicine, knowledge is needed about the correlation between climate change and health among healthcare professionals because healthcare professionals are used to implementing changes when they know the reason behind them. This knowledge could be initiated by the management of healthcare, for example, via organising education about this

subject (Philipsborn et al., 2021). Engagement at the highest level of an organisation shows the priority of sustainability (Bruin et al., 2019; Edwards, 2015).
Moreover, it is crucial that health care executives incorporate their sustainability efforts into the hospital's overall goals in order to develop the most efficient way to become more sustainable. Therefore, hospital staff of all ranks have an essential role: the frontline workers need to execute the policy made by the executives; if the policy is environmentally sustainable, then the whole hospital would become more sustainable due to everyone working together with the goal of generating as little waste as possible (Bruin et al., 2019; Edwards, 2015; Philipsborn et al., 2021).

Research about sustainability in the ED is scarce. Linstadt et al. (2020) recently described examples of sustainable practices involving hospital operations, department initiatives and individual actions that could transform EDs into climate-smart EDs, making them more climate-friendly. Separately, Spruell et al. (2021) discuss sustainable actions that healthcare workers can take in EDs and the current knowledge gap in implementing these practices. They stress that EDs have to learn from other departments about sustainability and increase research focused on sustainability in EDs (Spruell et al., 2021).
More research on sustainable practices in operating rooms has been conducted than in the EDs. Said research has concluded that more leadership, guidance and support are necessary from national bodies, including increased monitoring and regulation of these practices (Harris, Bhutta, & Rizan, 2021). These findings could be implemented in the ED as well.
The disposal of medicines also impacts the environment. Although sewage is treated, medicines may still influence the environment negatively (Kümmerer, 2009). Antibiotics can remain and may influence the quality of the water and thus potentially cause antibiotic resistance (Cabello, 2006). Therefore, an innovative policy, such as the drug take-back program and educating healthcare workers about this, is needed to motivate them to become more willing to implement the existing drug disposal policies more effectively and to prevent environmental pollution through medicine waste (Bhayana, Rehan, & Arora, 2016). The high amount of antibiotic-based toxic waste in sewage is partly caused by the ease with which antibiotics are prescribed and used. To address this problem, the national government has set up the program '*Chain approach to medicine residues from water'* to reduce the number of drug residues in (drinking) water (Rijksoverheid, 2019). A study about disposing of medicines showed that nurses (76%) have better knowledge than doctors (59%) regarding methods of disposal of unused or expired medicines (Bhayana et al., 2016).

Research by Wiek et al. (2011) showed that education for sustainable development is essential for (future) healthcare workers. Competencies in sustainability include a combination of knowledge, skills, and environmentally focused attitudes regarding successful task performance to switch from problem-solving approaches to systems approaches. Here relationships and connectivity are stressed between organisations and communities while keeping the real-world sustainability problems, challenges, and opportunities in mind (Dale & Newman, 2005). In addition, a market transformation must occur, including new business models, new professions and societal change with sustainability as a priority (Wiek et al., 2011).

Research from Polivka et al. (2012) indicated that public health nurses, especially younger nurses, are especially willing to take action against climate change. However, they lack the power to change specific policies. Due to limited resources and personnel available, addressing the health effects of climate change by allocating scarce resources is challenging (Polivka, Chaudry, & mac Crawford, 2012). Creating space for younger generations of healthcare workers that are more accepting of implementing environmental sustainability policies could go a long way toward solving the problem. Research from Naranjo-Gil (2016) showed that implementing climate change actions resulted in negative organisational performances in the short term, such as wasted resources and poor performances, but positive effects on performances in the long term, such as reducing costs and improving performance and efficiency. The lessons learned from this research are that hospitals need to design comprehensive management control systems combined with coordination and decentralisation of hospital organisations to implement environmental sustainability policies successfully. This approach would assure that environmental sustainability policies are implemented correctly without discouraging healthcare workers (Naranjo-Gil, 2016).

Another method of growing awareness in the workplace might be by creating a waste management plan that incorporates rules that promote awareness (Kleber & Cohen, 2020). While plastic has been used in healthcare since the 1960s, it was not until thirty years later, in 1995, that the Environmental Protection Agency (EPA) identified incineration of medical waste as a public health problem (Environmental Protection Agency (EPA), 1995). In 1995 the EPA identified the environmental, animal, and human harm caused by medical waste pollutants. Therefore, they implemented rules and legislations in 2013 on pollutants from

healthcare and began monitoring whether these waste management plans were followed correctly. Since then, hospitals and their suppliers were required to adhere to these rules and legislation. Making these EPA regulations stricter would force hospitals to work with their suppliers to change their packaging, and by asking and talking about the subject, more awareness might eventually be created (Environmental Protection Agency (EPA), 1995; Kleber & Cohen, 2020).

Another approach hospitals use to prevent unnecessary waste is 'lean' healthcare (Singh, 2019). *Lean* is a well-known manufacturing approach that focuses on reducing waste to eventually create value through quality products and services (Shah & Ward, 2003). The role of hospital staff in implementing lean in a healthcare organisation is central because they need to work according to the lean principles. Research showed that lean healthcare organisations could mitigate their environmental footprints (Singh, 2019). A reduction of emissions by hospitals might be accomplished if hospital staff is made aware of the importance of working according to lean principles and acting upon these principles. In the research of Singh (2019), it is mentioned that environmental sustainability is automatically inbuilt in working according to lean if an employee is involved in implementing lean. Instead of having a top-down management approach, lean gives rise to bottom-up approaches, where frontline workers perform the innovation and managers trust and support them (Drotz & Poksinska, 2014). Taking these lean principles into account might help solve the environmental challenges, partly due to the high waste production faced at the ED.

Waste reduction can be achieved using bottom-up approaches because the frontline workers might act as problem solvers because they know where improvements can be made and are committed to improving their work (Drotz & Poksinska, 2014; Singh, 2019). In their daily work, employees encounter several opportunities on the work floor to improve procedures, and if given the opportunity, they can take the initiative and consequently feel ownership of the outcome because they are responsible for the patients' health and safety. In addition, for fruitful discussions, multiple perspectives might be beneficial instead of using only the managers' point of view to make improvements that can positively impact environmental sustainability (Riordan, Vandenberg, & Richardson, 2005). According to Drotz & Poksinska (2014), another advantage of using bottom-up approaches is that employees can implement policies that they have seen to be effective and workable. When undertaking bottom-up approaches, the focus is

shifted from clinical autonomy and professional skills to process improvement and teamwork, which is necessary to implement sustainable improvements and policies.

Combining the above approaches to demonstrate the hospital staff's role in creating environmental sustainability awareness, implementing lean principles on the work floor might be helpful for hospitals through welcoming bottom-up approaches. Research has also shown that it is essential that management leads the effort by emphasising to employees that sustainability is a priority. Since management is tasked with making financial decisions, they must decide whether to allocate resources to educating the staff about environmental sustainability. Moreover, identifying and using waste management plans would grow awareness since employees would be required to stick to the rules of such a plan.

In table 1, a short literature overview is presented with ideas on sustainable healthcare initiatives in the healthcare sector through engaging various stakeholders. A combined effort among and between these multiple stakeholders can position healthcare to impact the environment positively. Figure 2 shows the many individuals that play a role in the environment. Moreover, figure 2 also indicates which stakeholders are more visible and less visible in current research. The literature used in the previous section is summarised in table 1 and coupled with a type of healthcare actor: healthcare management, nurses, doctors, supporting staff or patients. Predominant actors in sustainability research seem to be healthcare management, followed by nurses and doctors. In sustainability research, the less mentioned actors are patients and the supporting staff, such as cleaners.

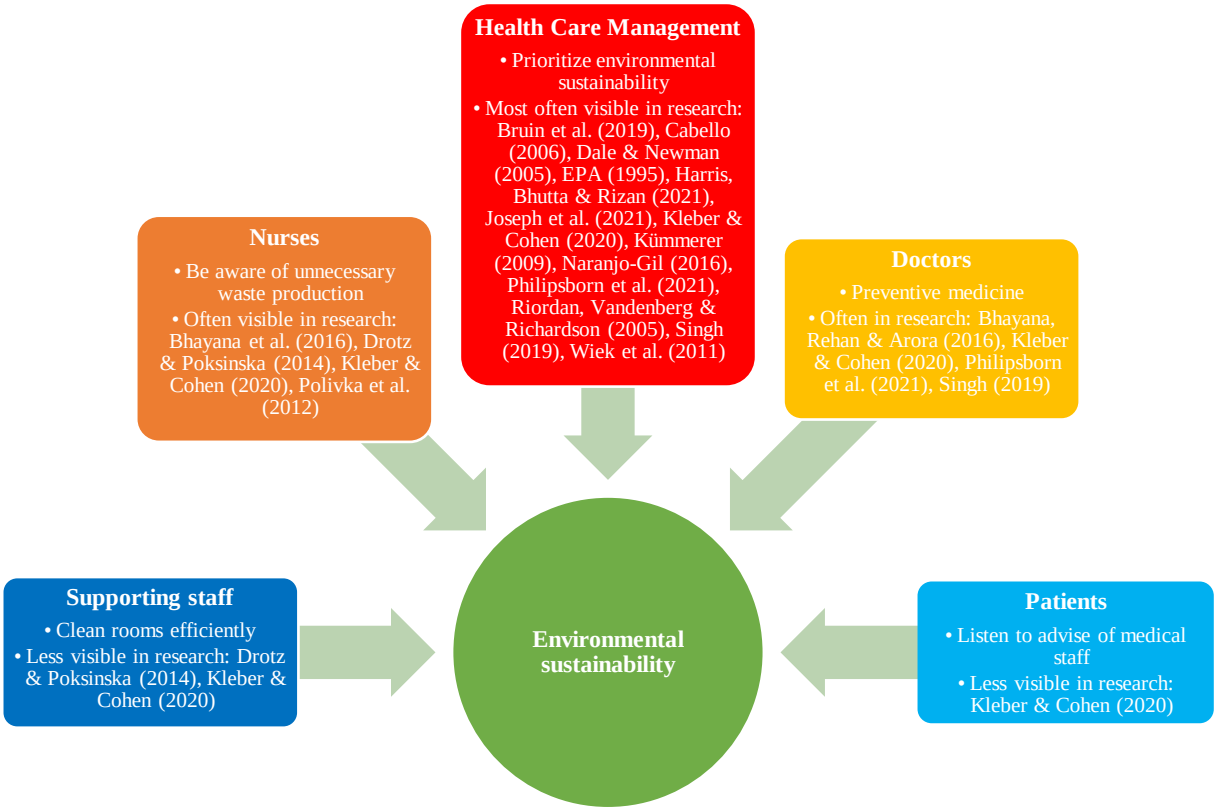
Table 1

Overview of ways to increase environmentally sustainable awareness

Author	**Year**	**Manner of rising environmentally sustainable awareness**
Bhayana et al.	2016	Educate healthcare professionals about drug take-back program
Bhayana, Rehan, & Arora	2016	Educate doctors better regarding the method of disposal of unused or expiry medicines
Bruin et al.	2019	Engage highest level of organisation to show priority of sustainability
Cabello	2006	Know the consequences of anbiotic resistance
Dale & Newman	2005	Integrate system approaches concerning sustainability
Drotz & Poksinska	2014	Use more bottom-up approaches for waste reduction
Environmental Protection Agency (EPA)	1995	Give more attention to the incineration of medical waste as a public health issue through stricter rules and legislation
Harris, Bhutta, & Rizan	2021	National bodies execute more leadership, guidance and support including more monitoring and regulation
Joseph et al.	2021	Give more attention to type of plastic, sorting and recyclability
Kleber & Cohen	2020	Focus on preventive medicine and create waste management plan
Kümmerer	2009	Know the consequences of medicines in sewage
Naranjo-Gil	2016	Design comprehensive management control systems which encourage healthcare to execute sustainable hospital policies
Philipsborn et al.	2021	Give education to healthcare professionals about correlation between climate change and health
Polivka et al.	2012	Raise decision power among public health nurses to make up and change policies
Riordan, Vandenberg, & Richardson	2005	Use multiple perspectives for fruitful discussions regarding sustainability
Singh	2019	Implement lean healthcare and work according to the lean principles
Wiek et al.	2011	Educate healthcare professionals about sustainable development and its priority

Figure 2

Relationship of stakeholders and environmental sustainability research



2.3 Reflexivity and reflexive spaces

The findings described in this thesis were obtained using reflexivity research. Reflexivity research consists of being aware of your actions, the behaviours of others, and their occurring context (McHugh, Lawton, O'Hara, & Sheard, 2020). Wiig et al. (2021) argue that reflexive spaces create resilience in healthcare regulation and management. In addition, it can also create challenging responsibilities for the management, which may result in an increased awareness of sustainability in healthcare (Cotter, 2014; Meyer & Willis, 2019). To engage healthcare workers in knowledge creation, focusing on first, second and third-person inquiry might be helpful in systems research. The first-person inquiry involves researchers' actions in everyday practices, including self-reflexivity (J. Marshall, 2004). The second-person inquiry focuses on the cooperation between people with mutual concerns within an organisation, including reflexive spaces. The third-person inquiry requires the broader community for inquiry and can include participatory action research.

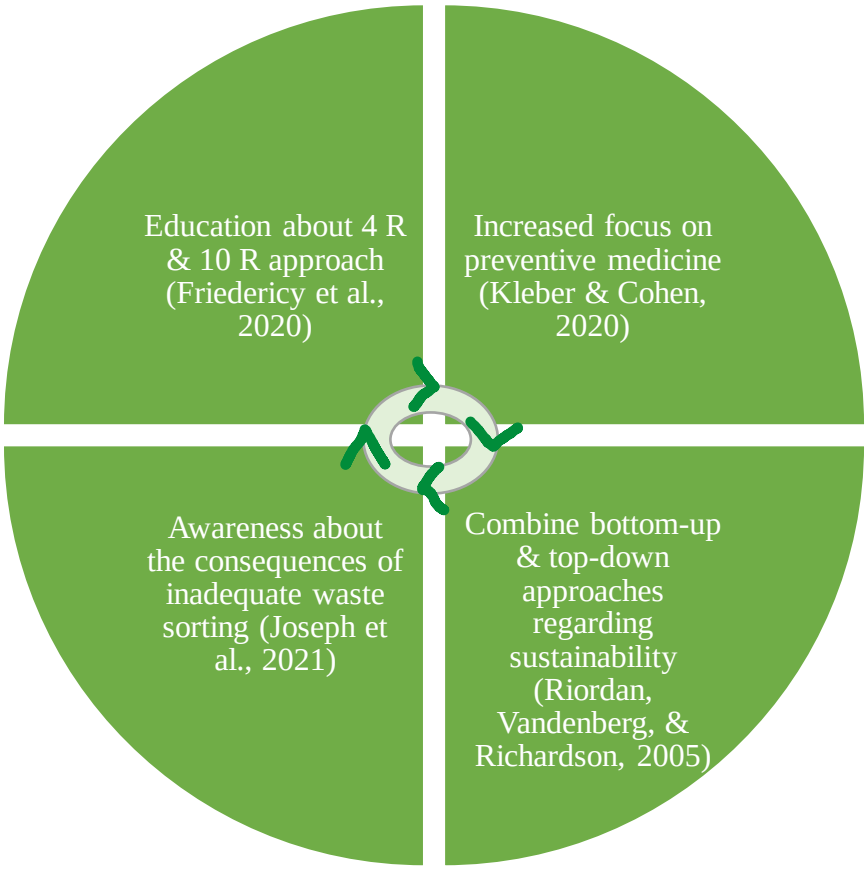
When awareness is created around sustainability, and thus tacit knowledge is generated, this tacit knowledge can eventually become explicit knowledge in practice (Addis, 2016; Bradbury, 2015; J. Marshall, 2004). In this research, *tacit knowledge* can be defined as personal know-how, which is context-dependent and indirectly influences awareness through photos to make the environmental problem visually attractive, yet not directly relating to actions and know-how. *Explicit knowledge* can be defined as thinking and acting with the knowledge in practice (Addis, 2016). Talking about environmental sustainability, for example, through reflexive spaces created by reflexive tools such as storytelling, reflective journals or reflexive conversations, might support converting tacit knowledge to explicit knowledge as dialogue to increase awareness about the importance of this subject (S. Marshall, 2014; Ngo, 2020; Wiig et al., 2021).

2.4 Conclusion

This research might serve as a framework for exploring the growth of environmental sustainability at the ED, by including different clinical practices when combining the above theoretical components. Examples of these clinical practices can be implementing education about the 4 R and 10 R approach, which may entail an increased focus on preventive medicine, the combination of management and frontline workers regarding sustainability, and awareness of the consequences of inadequate waste sorting. Figure 3 shows the different clinical practices mentioned in this chapter to grow environmental sustainability and raise environmentally sustainable awareness in hospitals by employees and management. All these practices are interconnected and may reinforce each other when performed well.

Figure 3

Examples of clinical practices to grow awareness of environmental sustainability



Chapter 3 Research method

The following chapter will begin by explaining how the data is collected, including a general overview, the semi-structured interviews, the photo-reportage and the personal observations. After this, the data analysis will be explained, followed by the data validity and reliability. Lastly, the ethical part of this research will be discussed.

3.1 Data collection

General overview

Qualitative research was performed as an action researcher in the organisation, the LUMC, through engaging active participants, mainly via semi-structured interviews, complemented by a photo reportage at the ED, participation in the Sustainable Hospitals Lab, discussions with members of the program LUMC Green and Healthy, observations of sustainable practices within the LUMC, and reflective journaling (Centre for Sustainability, 2021; Coghlan & Brannick, 2019; Ortlipp, 2015).

Action research involves a method of systematic enquiry into one's own practice. As an action researcher, working at the ED and seeing the amount of waste produced, other co-workers were enlisted in the process of bringing about change (Coleman, 2018; Somekh, Posch, Altrichter, & Feldman, 2018). In the ED, waste can include various materials, for example spilled solutions, water, and even polluting gases.

The Sustainable Hospitals Lab includes workshops, lectures, and discussions with other researchers involved in environmental sustainability (Centre for Sustainability, 2021).

LUMC Green and Healthy is an umbrella programme that includes the LUMC Green Teams. These are groups of employees from all divisions committed to making the LUMC more environmentally friendly, for instance, via sending newsletters, implementing smart bins that measure waste in the kitchen, and many other initiatives to make the LUMC greener and healthier (Team Zorg voor Klimaat, 2022).

The medical background of the researcher and the current position at the ED in the LUMC allowed research in the hospital; therefore, this thesis could also be considered insider research (Coleman, 2018).

Semi-structured interviews – relate to sub questions 1, 2, 3 and 4

In this research, fourteen (n=14) semi-structured interviews were carried out. For this thesis, the semi-structured type of interview was chosen to ensure standardisation between interviews,

while the respondent was still given enough space to interpret the questions (Mortelmans, 2013). A topic list was used to structure the interviews (Appendix 1) (Thiel, Duncan, & Woods, 2017). Interviews lasted between 26,30 and 53,15 minutes, with an average duration of 37,59 minutes. Most interviews were in person, but some were conducted via Microsoft Teams according to the respondents' preferences. The purpose of these interviews was to collect respondents' opinions, thoughts, and feelings regarding raising awareness about sustainability and its implementation in healthcare management. To guarantee respondents' anonymity, respondents are numbered when referring to them in this research (Appendix 2).

The interviewees were recruited through colleagues of the ED, the Sustainable Hospitals Lab, personal networks and further application of the snowball method (Thorogood & Green, 2004). Respondents were reached via email following a confidentiality procedure (Appendix 3). The snowball method was used to approach other workers from the LUMC to interview. Inclusion criteria were that interviewees work at LUMC and are interested in contributing to sustainability in healthcare management and organisation. In total, twenty-two people in the LUMC were reached, of which ten were from the ED and twelve did not work at the ED but did work in the LUMC. Of the nominated respondents, fourteen agreed and took part in the study. Eight of the fourteen interviewees were ED staff of the LUMC. Six of the fourteen interviewees were other stakeholders engaged in growing awareness of environmental sustainability in the LUMC to answer the sub question 2. Ideas regarding raising awareness about sustainability in healthcare management and organisation were derived from top management and other healthcare workers down the management ladder (Kim, Sting, & Loch, 2014). Therefore, interviews were conducted with healthcare workers across higher and lower functional ranks, as mentioned in figure 2. The endpoints of the interviews are shown in Appendix 4. Involving joint inquiry through these interviews can be seen as second-person action research (Bradbury, 2015; J. Marshall, 2004).

Photo-reportage – relates to sub questions 1 and 4

To create awareness, a photo-reportage of waste produced at the ED was made. These photos act as a first-hand experimental illustration to answer sub questions 1 and 4. During interviews, referrals to these photos were made when questioning "if creating reflexive spaces can contribute to improving environmental sustainability in the emergency department". During the research period, sharing the photos with multiple EDs in the Netherlands was discussed with several parties, such as the sustainable ED (de Groene SEH). On the second of June 2022, the photos will be presented at the Dutch Emergency Medicine Conference in Egmond aan

Zee. Subsequently, the photos will be distributed to eight hospitals in the Netherlands to raise more awareness about sustainability in the ED, starting at the ED of the LUMC. This research method can be seen as third-person inquiry action research because of the broader community involved through these photos (Bradbury, 2015; J. Marshall, 2004).
In addition, the photos were also shared with workers in the LUMC via newsletters and blogs of the Sustainable Hospitals Lab. As discussed with the facilities management of the ED, in the future, the idea is to share these photos with hospital staff via Albinusnet (intranet of LUMC), which can function as a creative reflexive space to stimulate discussions between healthcare workers and healthcare management. Moreover, these photos were used to explore the current situation (S. Marshall, 2014).

Personal observations – relate to sub questions 1, 2, 3 and 4
As an insider action researcher, participation in changes along the way and identification of initiatives of various doctors seemed relevant; therefore, observations were written down in a reflexive journal (Ortlipp, 2015). These observations were used to identify which activities about sustainability are available in the LUMC and where improvements can be made. This self-reflexive inquiry can be seen as first-person action research. This research comprised a focus on reflexive spaces (Wiig et al., 2021), and on researchers' reflexivity, which could be called the action research spiral (Coleman, 2018). Moreover, Coleman (2018) emphasised turning the lens onto the researcher, about choices made, a quality criterium for a qualitative researcher (Cotter, 2014; Meyer & Willis, 2019; Subramani, 2019).

3.2 Data analysis

Braun and Clarke (2006) designed a 6-phase guide to thematic analysis, which is used in the data analysis of this research to answer the research questions (Appendix 5, Braun & Clarke, 2006, p.87). In practice, this meant; the conducted interviews were audio-recorded and transcribed verbatim. Transcription was performed by listening to interviews and simultaneously typing the data into Microsoft Word. Simultaneously listening to the interviews and typing ensured familiarisation with the data. All interviews were in Dutch; therefore, the essential parts of the interviews were translated into English. The additional photos at the ED served as a creative illustration of the data from the interviews and to get feedback on this type of inquiry to increase awareness in some of the later interviews.

After transcribing all interviews, Atlas.ti was used to code the data in two distinct phases. First, the data was open coded; then, the data was axially coded (Thorogood & Green, 2004). In the open coding phase, the data was 'fractured' to get familiar with the data. Based upon ten repetitions of patterns and utterances, codes were chosen and coloured with colour-coded tags. Axial coding gave rise to sixteen codes (Appendix 6). After the open and axial coding phase, the thematic analysis phase was conducted, in which the sixteen codes were merged into the final five themes (Appendix 7).

3.3 Validity and reliability

Peer review of the thesis writings was performed within the thesis group by the supervisor and peers from the supervision group to increase researchers' reflexive self-awareness. Moreover, observations from the reflexive journal served to interrogate the researchers' own choices (Ortlipp, 2015). In addition, triangulation was employed by combining different methods: semi-structured interviews with varying workers of healthcare as the primary data collection method, and as supporting resources, the photo-reportage and researchers' observations to gain multiple perspectives (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014; Coghlan & Brannick, 2019; Coleman, 2018; Noble & Heale, 2019). Moreover, member checking was performed after writing the results to circumvent researcher bias and increase the validity and reliability of this study (Birt, Scott, Cavers, Campbell, & Walter, 2016; Doyle, 2007). Two interviewees asked for changes in the transcript. The other twelve interviewees agreed on the transcripts and were glad to receive the summary of their interviews and the initial results. This process acted as a double feedback loop for more robust research results and to add a layer of reflexivity during the research. Furthermore, at the Dutch North Sea Emergency Medicine Conference, the photos of the photo dialogue were presented and discussed, which could be seen as an extra check for feedback on the impact of the photos.

3.4 Ethics

Interviewees were asked for consent if they approved recording the interview and using the data for the research, according to the privacy-related rules of conduct of Erasmus University Rotterdam and the Association of Universities in the Netherlands (VSNU). This research followed the "Code of Conduct for Scientific Practice" of the VSNU to secure the interviewees' privacy. The data is the property of the researcher and was stored on a university account that is accessible only to the researcher. Moreover, participants could withdraw from the study at

all times (Braun & Clarke, 2013; Mortelmans, 2013; Orb, 2000). Patient data and patients were not photographed due to privacy reasons. Personnel was only photographed if they gave consent.

Chapter 4 Results

The following section will outline the results, which primarily emerged through analysis of the conducted semi-structured interviews. The insights generated by the adjacent research strand through the photo dialogue will be added as a second instance. Personal reflections of the researcher were noted in a research journal to ensure reflexivity. This section will end with a short reflection on the results and themes.

4.1 Semi-structured interviews

This section will present topics that emerged through thematic analysis after the open and axial coding phases. These themes will outline the main themes found regarding respondents' stance regarding the current state of awareness at the LUMC, especially the ED, and represent what actions could be taken to make the ED more sustainable. Some themes are interconnected.

4.1.1 Awareness of environmental sustainability

The first line of inquiry during interviews was to gather a general understanding of how interviewees felt about the current state of awareness of environmental sustainability in the ED. Responses to this question were similar across all interviews. Most interviewees stated that the current state of awareness is not very present and that the subject is not yet well-known at the ED. In addition, the interviewees mentioned that they became more aware of this subject during the interview. Some said that this was the first time they spoke about sustainability with someone because no one had ever suggested thinking about it. For example, when respondents were asked what they thought of the current state of awareness, they replied as follows:

"*Honestly, well, almost nothing [awareness about environmental sustainability on the ED is almost not present] (…) and look, if it can be done sustainably, then it is a good thing, but I do not feel that I have any compulsion to make that a spearhead (…) no one has ever had a conversation with me about this kind of topic*." – Respondent ED3

"*Well then, I think that's limited and why, but that is my feeling, that so I don't know how others react when you ask this question to them. But I think it is limited.*" – Respondent ED8

When asked about the importance of sustainability and if awareness has to be raised, most interviewees realised, during and after the interviews, that action should be taken. The

argument that more awareness is needed for their children's future was one of the reasons for their response.

"*I think it is a very important subject and if you, if you want to stay alive on this planet, we have to. They say on all sides, guys, if we continue like this, soon there won't be anything left for your children, then you really have to think, shit, yes, you can think for a long time, it is far from my bed and I do not have any grandchildren yet or some people say, well, that is the end of the world then we won't be here anymore. Of course, you can think like that, but that is what I mean by that awareness, there just has to be a lot more of it." – Respondent ED7*

LUMC has a LUMC-wide Green Team that takes initiatives in various parts of the hospital to make it greener and healthier. When the researcher mentioned this to the interviewee, they responded that they had no idea this existed at the ED. When asking a respondent from the facilitating company focused on executing the program Green and Healthy, the response was promising for the ED.

"*No, but that also crossed my mind as I sit here talking, that I think of well we have mentioned it, but (…) it is not alive. Yes, we have drawn in where we want to put [waste separation bins], no, that was already the case with the building plans, which were almost ready, until we said, oh, but we haven't taken into account the place for the bins in the coffee room at all.*" – Respondent ED8

"One of the things we picked up in the programme Green and Healthy is to draw up a very clear communication and marketing calendar. So since the programme, which is already two years ago, we have said that we are going to write very active newsletters, which come every month, and these newsletters are really about what you can achieve within your own sphere of influence. We will make sure they are very practical stories, so that on the one hand you will be inspired by your colleagues, but on the other hand, you will also hear about where you can go when you want to take steps within your own department." – Respondent LUMC2

Most interviewees mentioned that they thought it might be a good idea to increase awareness about sustainability at LUMC. When asked how they would do this, they gave various responses, including changing the mindset and repeated exposure to the message. Also, they

suggested making it visual that which can be made from waste or making people aware of the prices of the materials.

"*It is also a kind of mindset among nurses, that you deal with materials, equipment or things in a different way.*" – Respondent ED3

"*Repetition of messages, that is essential to finally convince people that something needs to be done*" – Respondent LUMC3

"*I think it's good to show results or to say, if you throw away this way six times a day, it can be made into that, and if you throw it away with that [throwing something away in the wrong waste separation bin], it damages our planet. I'm just saying. And of course, there are figures about that and I think it's good if you let that come back as a kind of theme*." – Respondent ED7

"*And to make it more visual, to extend the price tags in the cupboards, in the newsletter, maybe a short message with did you know that [something informative regarding sustainability] with a picture and a price where people think oh really? I do notice that when I say how much something costs when they drop it, it scares them [ED employees]*." – Respondent ED2

When taking the first-person inquiry into account, the researcher's point of view might also be interesting to indicate that the current state of awareness about environmental sustainability is low at the ED.

"*I just had an interview, and I am sad about the current state of awareness. Most people in the ED whom I spoke to told me there is no or low awareness about the importance of working environmentally sustainable. I am curious if they will be more aware of this subject when I show them my photos."* – Reflexive journal, March 2022

4.1.2 Barriers

Barriers to why people are not acting sustainably in the hospital could be categorised into three main topics; lack of financial resources, time constraints, and people's mindset. The most

frequently mentioned reason was the allocation of financial resources. LUMC has to economise, so innovations and ideas, such as regreening, are left untouched or postponed until the financial position is more favourable. This is due to the fact that at the current time, regreening costs would require too much money to invest and would not generate short term profit. This lack of financial resources results in insufficient time for employees to sit with the Green Team or think individually about sustainable options, making it difficult to implement meaningful changes. Changing working practices and implementing new sustainable actions takes time and effort. People's behaviour is also a factor that hinders certain sustainable actions. Overall, many reasons were given by the respondents why sustainability actions had not yet been implemented in the ED.

"*A lot has to be done in a very short time*." - Respondent ED2

"*Yes, money, time and people's behaviour, so you have to have people on board, because if you don't get them on board, then it just does not happen.*" – Respondent ED5

"*Formally, of course, it is true that if fewer people come to the hospital, you will indeed produce less waste, but on the other hand, if you want to be a healthy company, you have to look for other things.*" – Respondent LUMC4

"*When I ask people about the barriers why they are not working greener or more sustainable, I often receive the answer that they do not have time or money for more sustainable actions. This makes me wonder: is there a manner to convince them that in the end, it will raise money and will increase public's health?"* – Reflexive journal, April 2022

Moreover, people think that they are unable to exert influence on the environmental problem because of the intangibility of the subject and the position they are in. In addition, there is a belief that there is insufficient transparency; therefore, employees can not draw a direct line between their actions and how they would impact environmental sustainability. Thus, the above results in low motivation to change their work habits.

"*It's such a big organisation that it becomes anonymous [when you throw something away], and then it feels like a drop in the ocean, I think if you just don't throw away that one*

infusion, and secondly also by covid [reasons why people throw something away so easily]." – Respondent ED5

"*No, it's just not alive. You are not talking about it. You are not talking about it; there is no awareness. It is not alive. No, but maybe that's also because you want to put something down for the here and now, (…) that's also a bit with sustainability. You only notice the consequences when it's good, very far [in time], isn't it [you only notice the consequences of not being sustainable in the far future]?*" – Respondent ED8

"*But the problem is that you never get a good understanding of why what's happening here (…) we are just a bit on such a piece of this iceberg, and that's (…) not transparent*." – Respondent ED1

In the previous section about how to create awareness, the strength of repeating the message was mentioned. Repetition can also be counterproductive, as seen during the covid crisis, where people were shown many posters and banners. Interviewees said that there should be another way in which people are informed. The Green Team of the LUMC writes every month a newsletter about green and healthy initiatives. However, people need to sign up to receive this newsletter, which results in only reaching the employees who are already interested in this subject.

"*People are a bit fed up with all those posters and banners*." – Respondent LUMC4

"*Yes, it is a monthly newsletter that is distributed among the people who have signed up for it, and these are tricky little things within LUMC: how do you reach all the people? Well, we have to struggle with that every now and then, because someone has to know about the newsletter to be able to sign up*." – Respondent LUMC5

"*This week, I will be in the newsletter of Green and Healthy LUMC; therefore, I asked all my colleagues at the ED if they had already signed up to receive this newsletter; however, not everyone is willing to sign up because they said that they already have too many emails, so they will look at the article where I am in if I show it to them personally.*" – Reflexive journal, April 2022

Interviewees also mentioned that it is essential to be constantly stimulated to think of sustainable options, for example, via one-to-one dialogues. If there are no specific point persons, people are not reminded to work according to more sustainable guidelines; people tend to forget the importance of sustainability in the acute setting of the ED. Patient safety in the critical department, such as the ED, is given priority, and therefore, people focus entirely on working to save a patient's life rather than on environmental sustainability.

Interviewees working in the ED mentioned that often many unnecessary separate packaging was used, which costs extra time and money, and if these were not used, time and money could be saved.

"*I think everyone wants to do their best. Only then people have to be continually stimulated. There has to be continuous dialogue, and I think that is best done one-on-one*." – Respondent ED8

"*Right, the thing that we come up against in a lot of things at LUMC is that the emergency department is not an outpatient clinic, it's not a nursing department, the emergency department is a critical department and that means that the moment a patient comes in, literally and figuratively speaking, every second counts, so all the changes that take place, at whatever level, should actually be measured against that. Is it in the patient's interest?[can the patient be guaranteed with best possible patient safety?] Because if that means that the reception of a patient who comes in is delayed by a certain change, you can't justify that*." – Respondent ED2

"*And of course, part of that is patient safety, they say. Under the guise of that, it's used, it's all there in separate packaging (…), but I don't think that's necessary, because it's not that much faster to break open that one ampoule (…) but if you see how many actions, how many little things you have to open for one action, that's often the case [which means that time and money can be saved when you do not package everything separately]*." – Respondent ED6

4.1.3 Actors involved

During the interviews, the interviewees were also asked whom they would involve in increasing awareness via partnering with other actors. The purchasing department was

mentioned frequently, as well as the board of directors because they can carry the vision for the whole hospital and have the power to change policies. However, interviewees also mentioned that how they work is often dependent on laws and regulations. They argued that there should be a change from the political side because this will affect working practices and may create more awareness. When laws and regulations change, the manufacturers must adapt their working practices to deliver more environmentally friendly products and materials.
In addition, the cleaning service is also important in raising awareness, as they are using many different chemicals and materials to clean the ED and are tasked with discarding the waste. Therefore, they should be trained to separate waste properly. Healthcare workers must know how to separate waste since if it is not done correctly, the waste bag can no longer be used for recycling.

"*So then it actually goes further to the manufacturer. I don't know how far you want to go, but then you would have to include the manufacturer., I think you should also involve the cleaning department because they should also be well aware of what does and does not belong together and how it is destroyed, I think. And I think it should be the team, the people who work in the field, but I don't know of any specific functions or anything like that*." – Respondent ED4

"*And then the purchasing department joins in and says this is allowed and that is not allowed. And then procurement comes along and says this is allowed and that is not allowed.*" – Respondent ED3

"*At work I sometimes see wrong objects enter the wrong bin, and then I get frustrated. If I see this happening, I try to make a joke of it and tell the person who did it, to be aware of this mistake, and then I ask them to put it in the right bin. However, I cannot do this alone, and I believe all actors on the ED are responsible for separate waste adequately.*" – Reflexive Journal, February 2022

4.1.4 Reflexive space

It could be argued that although healthcare workers think about sustainability, too few implementation measures are explored, learned or adopted at the ED due to lack of time and the working environment to which people are accustomed. While some professionals are aware

that they are not taking action regarding sustainability, this is because it has low priority at the moment, and therefore, they will only take action if and when it becomes a major obstacle.

"*That I think, oh, what an idiot I am not to do anything about it, and I still think, I'm not going to do anything about it. But (…) by having such a conversation, you do create awareness. That you think, yes, that's not my priority right now, and is that good, is that bad? So you create something for me to think about. And that's something that I thought just now"* – Respondent ED3

"No one has ever talked to me about why I do or don't make choices in this area, and that's just the system and that's not bad, but maybe that's what's needed in organisations. That you say 'hey, you don't have to do anything, but this is what's going on in organisations, or what organisations want, and how can you as an emergency department contribute to this or something?' Maybe that's the crux of the matter." – Respondent ED3

"*I cannot believe what I just heard. One respondent told me that it was the first time speaking about sustainability with someone. However, I am glad that I interviewed this person and that this person is now also thinking about sustainability!"* – Reflexive journal, April 2022

To convert tacit knowledge into explicit knowledge, it appears that employees want more transparency about the hospital's financials regarding sustainability and the way waste is currently processed. For this to occur, it would have to be from a top-down approach since management and the organisation are the ones who have access to the finances and who set policies. In addition, a bottom-up approach is also necessary since it is the employees working on the floor who see where changes can be made. Therefore, it appears that a joint effort between management and the employees would be required to generate an effective approach.

"*It would, of course be nice if it were clear how the money flows here, whether or not it matters if we leave the light on or not, whether there is a fixed contract for this and that they just say yes because that's the feeling you get a bit because otherwise, you will turn the light off. Isn't that what you do at home as well, that you turn off the stove?* (…) *But you also have to make sure that it is transparent and that you have clarity of guys what do we stand for?" –* Respondent ED1

"*I think that if you pay more attention to it, that you create more attention to it, that you also get a greater support for it*." – Respondent ED6

To become more sustainable, it is also necessary to reflect on why certain decisions are taken, for instance, why disposables are used or why particular things are thrown away.

"*Well disposables (…) looking back at the hospital we are in; I wonder to what extent it is necessary to use disposables so much*." – Respondent LUMC1

"*I think it really does help because if you are more aware of it [to act sustainable] you start to think critically about whether I should throw it away. Can't I use it again? Then you need more than just me. So then you have to reach out to an entire department and see how we can do that?"* – Respondent ED5

"*Today was unbelievable; I just presented my photos at the Dutch Emergency Medicine Conference, with more than 700 emergency employees. Moreover, the president of the Dutch society of emergency doctors came to me and told me that he was amazed by my project. In addition, I received many other compliments, and I feel truly honoured that I got the chance to share my research with such a wide audience."* – Reflexive journal – June 2022

Views regarding sustainability in the future, for instance, in 2030, differ between the respondents. Some are optimistic, but others think that the attention to sustainability will only last for a couple of years and that it is difficult to change the whole system into sustainable practices.

"*Or that it is a hype, just like quality is sometimes a hype. It seems to be becoming less important now than it was five years ago. So I don't know if this is just another hype or if it will stay, I don't know. I can't predict that. There are a lot of things that come along with this is the solution, and then it goes away again and comes back in 20 years*." - Respondent ED3

"Realistically, I think that only the awareness, um, that there is more awareness. Purely with what we have now so that people are more aware of how they separate waste in the communal areas, and with the patient, that they then look carefully at which materials should go in SZA bins, which materials should go in a needle container, which in a normal waste

bag, which in a covid waste bag, you know that you really get into it that everyone is really good at which waste you put in which bag." - Respondent ED4

4.1.5 Sustainable actions

Some respondents expressed their concerns about the few sustainable actions taken in the LUMC. However, other respondents argued that many steps had already been taken. Professionals from the ED mentioned that the Green Team, a group striving for a greener hospital, stopped coming up with new initiatives at the ED after implementing the waste bins for sorting. This is a pity because if they had been concerned with implementing additional initiatives, had they followed up; more sustainable actions could have been proposed and implemented. The reason why the Green Team gave for not following up at the ED after installing the waste bins was the COVID-19 crisis. This impacted the time which the Green Team had to come together for new plans, and the issue that priority was not there for becoming more sustainable.

"*I can remember that well. Green team, that was at the time of the introduction of separating waste, and that was also the last time I put those bins there, and that was it*." – Respondent ED8

"*It is just hope that I can be more actively involved in the green team, I am part of that, but because of all the crises over the past few years, I have not been able to actively participate in it. So that is on my list to be actively involved in that*." – Respondent ED2

More sustainable actions are taken and are going to be taken now that the COVID-19 crisis is over. At the ED, they would like to switch from disposable to reusable tourniquets, as other departments have already done. The ED has president for this; for example, they were the first to use reusable blood pressure straps, while other departments still use disposables.

"*One that I would like to implement soon is, for example, the dunnage belts. We use a lot of disposable dunnage. Really a lot. So this is not only reflected in the waste but also in the costs. I have an alternative for this, and I have communicated this before, but then you end up with the communication and uniformity aspect again, so that's where it went wrong, so I have*

to find another approach, and I'm talking about the desigrip. That is a re-usable tourniquet." – Respondent ED2

"*What is going on now in LUMC, for example, is blood pressure cuffs. A lot of disposables are used within LUMC, but the emergency department doesn't, they only use the reusables, they have to be cleaned, that's in the protocol. So we don't use those disposables*." – Respondent ED2

"It is unbelievable, for every patient where blood needs to be drawn, one or two tourniquets, are used and thrown away afterwards, this has to be possible in a different way right? If reusable tourniquets are used, a lot of waste and thus costs will be saved I think." – Reflexive journal, March 2022

It has been suggested that the ED could support sustainability efforts by taking advantage of their collaborations with other departments in the hospital. Patients from the ED are often transferred to the intensive care unit (ICU) or the operation room (OR). Therefore, it might be a solution to make a package consisting of materials that are standardly used for each patient, which can be taken along the hospital journey to prevent extra materials from being used. This approach would contribute to increased sustainability and also cost reduction.

"*So it becomes a standard that the things stay with the patient, nice, but then there must be a change-over bin, where all the things that are delivered are taken back at once. Well, a standard has to be found for that, because at the moment there isn't one. And that has to be done in collaboration with the team from emergency and the team from the ICU. So that's the pilot that's going to start very soon*." – Respondent ED2

At the ED, action has also been taken to explore possibilities outside the hospital, namely in cooperation with suppliers, when ordering, work on reducing product packaging. In the future, this type of cooperation with product suppliers could contribute to reducing waste and promoting sustainability.

"*Nowadays, all tenders take into account that the package of requirements (PVE) also includes the fact that the supplier is accountable and keeps his promise about how he delivers the products. So with as little waste as possible, that if things have to be disposed of, that they*

either give it a second chance, so refurbish it and possibly give it to a good cause, or that it is indeed disposed of in a sustainable way." – Respondent ED2

4.2 Photo dialogue

The additional research approach was to see if showing photos of waste from the ED would raise more awareness about sustainability. The result of the photos is shown in Appendix 9. It was found that showing photos to interviewees instead of lecturing them about sustainability took less time and was more effective in conveying the message. Most respondents commented that showing them photos had a more positive impact on raising more awareness about the urgency of sustainability.

"*Visual conveys much more than reading or telling, telling, telling, because people get tired of it. So every time you have to come up with a way to excite people and a photo actually says a lot in one second that you would otherwise have to spend half an hour educating them about. So I think it's very useful and I think it's also very important and it's also a very good way of communicating.*" – Respondent ED2

"*I think the best way to work here is to see what the consequences are, so people do know that there is a lot of waste, but to see how much waste there is, and maybe also where there is unnecessary waste, I think that makes the most impression and thus also creates awareness so I think that, yes I think it is a very good way of approaching things, yes those photos*." – Respondent ED4

One such respondent commented that creating a photo dialogue is essential for people working at the ED because they are visually oriented due to their practical work. The influence of showing photos at the work place would be effective in changing habits because people would be confronted with the reality every time they see the photos.

"*Yes, we are all practitioners actually, so making it visual works, and it sticks much better, yes, so I think it is definitely a good thing*." – Respondent ED4

"*Now you might still be a bit of a nitpicker, like if you think, I'll take one less packet and or this can usually be reused once, then that's very much a one-man action, but if that's clearly*

visible, for example, because those photos are everywhere, then that does get easier." – Respondent ED6

In addition, it might be useful to inform employees to use photos instead of sending newsletters only. The majority of the respondents answered that the alternation of information is more effective, so after a while, the photos should also be altered. However, showing the photos next to the information stream of newsletters might be beneficial.

"*Yes, of course that's a different way of providing information in that photo I think that actually works better than a newsletter. And then, but then you also have to say at some point after so much time, I'll change it again*." – Respondent ED6

The photos can also serve as a platform for creating more awareness and as a magnet for starting conversations about sustainability. Since the ED is a critical department in which the daily workload makes it difficult to read new information regarding sustainability during work time, the use of photos may be an ideal solution to bring the message to the employees and create dialogues about the subject of sustainability. Ideas arising from these short moments of looking at a photo may then be brought to the working floor and spread on the working floor across all employees, so eventually, more awareness will be created.

"*Definitely, it can contribute a lot, because the more people know why, where does it go, does it really go separate ways? A lot of people assume that it is going to end up in one heap, no matter how nice it looks in the corridors. The more people know, the more they are given the space to ask the questions, and are able to see the material or images, the more it comes to life*." – Respondent LUMC1

"*You need a tipping point. And when you say I do that through art and photographs and that is how I create awareness. Yes, it is very important*." – Respondent LUMC6

"*Yes, that can support, I think, it can support. I think so (…) that does support it, you know, when you see a photo again, you think for a moment, "Oh, yeah", don't you? Let's pay attention to the subject that you see in the photo*." – Respondent ED8

4.3 Reflection on results

Different actors must be involved in implementing sustainable actions, such as the purchasing department, the board of directors, politicians, manufacturers, and the cleaning service. However, barriers arise when changes in working practices are proposed, such as financial issues, time constraints and people's mindsets. On the other side, this can be refuted by the fact that it can also save money in the long term. While reflecting on sustainability and thinking of how to grow this effort at the ED, people often pushed back, giving reasons why it is impossible or should not be prioritised. This presented the opportunity for reflexive space that could be used to influence these barriers. Creating a photo dialogue is seen as helpful in raising awareness about sustainability, leading to more sustainable thoughts and actions at the ED. Seeing the waste problem in a photo often works better than the usual manners of reading a newsletter or being lectured. This is particularly true in the ED, where patient safety is central and where there is a lack of time, so the normal workflow is prioritised over sustainability. In the following chapter, a model will be presented in which all previously mentioned themes will be interconnected.

Chapter 5 Discussion and Conclusion

In this section, the essential findings of this research will be explained according to specific sub questions and a new model that considers the relations between the different themes. Subsequently, the limitations of this research will be discussed, and possible recommendations for further research will be given. This chapter will end with an overall conclusion.

5.1 Analysis of sub questions

Hereafter the sub questions will be discussed, and the main findings from this research will be coupled with the existing literature.

5.1.1 What is the current state of awareness of environmental sustainability in hospitals, and specifically in the emergency department?

From this research, it became evident that the current awareness at the ED is visible to some employees; however, it is not sufficiently present in the whole department. An example that can be given of this is that an interviewee answered that this was the first time they discussed the topic of sustainability with someone. This finding was gripping and contrasted with the researchers' expectations. The researcher hopes there will be at least some more awareness through the PR campaign performed earlier by LUMC Green and Healthy. Interviewees often gave the reason for low awareness as being financial priorities, whereby sustainability was not a priority at the moment. However, this argument of having to save money can be disproved because, in addition to saving the environment, sustainable initiatives have been shown to save money in the long run (van Straten et al., 2021).

5.1.2 Who is involved in raising awareness about environmental sustainability in the emergency department?

This study has revealed that a positive culture and approach might help increase awareness and develop innovative ideas regarding sustainability. This outcome can be supported by existing literature; for instance, Spruell et al. (2021), whose findings indicate that a favourable twist of the culture in the ED is necessary so that 'climate-smart' practices are followed on the work floor. According to Philipsborn et al. (2021), healthcare professionals should know the correlation between health and its environmental impact and the positive influence of preventive medicine on climate change. Educating healthcare workers about environmental

sustainability is necessary from the researchers' perspective. Moreover, multiple stakeholders, such as the purchasing department, the suppliers, management, the employees at the ED, and many more, must be included in a successful effort to raise awareness about environmental sustainability.

Moreover, as indicated in our findings and those described in the literature, a combination of bottom-up and top-down management is crucial to change the work practices in the ED to become more environmentally sustainable (Bruin et al., 2019; Edwards, 2015; Philipsborn et al., 2021). Therefore, it is essential to motivate all individuals in the ED to collaborate and develop ideas regarding sustainability. Early adopters might pick up these ideas and implement them into working practices. For example, people from the Green Teams and those who are aware of sustainability might be receptive to working with individuals championing these sustainability efforts.

5.1.3 What environmentally sustainable actions have already been taken in the LUMC?

Since the 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future, people at LUMC have taken several actions on environmental sustainability. For example, the LUMC has taken several actions, such as establishing LUMC Green Teams. However, from the respondents' reactions, it became clear that these Green Teams are not always active, perhaps due to a lack of financial support and time allotment. Another initiative taken in the LUMC is the establishment of LUMC Green and Healthy. This group sends monthly newsletters to employees who have subscribed. When reflecting on this, it appears that, unfortunately, not all employees are automatically subscribed to the newsletter, and only those who are already interested in the subject read it. In an attempt to reach employees who are not yet interested, a photo dialogue was presented in the newsletter from LUMC Green and Healthy of April. When reflecting on the reactions from colleagues, these photos may help to grow interest and awareness about sustainability. Early positive responses, via social media have been received. In addition, presenting these photos at the Dutch North Sea Emergency Medicine Conference, which reached a broader range of ED employees, has resulted in many positive reactions and increased sustainability awareness.

"*Last week, my photos were enclosed in the LUMC Green and Healthy newsletter. Several colleagues told me they thought it was a great idea to show the waste*

from an emergency. I was fascinated to hear that my work amazed so many people and that I received many compliments about it. I hope that my work will help with growing awareness of people about environmental sustainability, via thinking more about what they can do to reduce waste." – Reflexive journal, April 2022

"*I just came back from the Dutch North Sea Emergency Medicine Conference, where more than 600 emergency physicians were present. I am happy to hear that many people reacted enthusiastically about the photos. People told me that they realised the urgency of working more sustainable should be more present and that my photos help them to raise their awareness about sustainability.*" – Reflexive journal, June 2022

Moreover, the LUMC Green Team has implemented waste bins, but more initiatives can be taken. Ideas from interviewees might support this, such as making specific people responsible for the theme of sustainability.

5.1.4 How can reflexive spaces contribute to improving environmental sustainability in the emergency department?

During the conduction of the interviews, the researcher noticed that just bringing up the subject of sustainability impacted the interviewee's mindset. However, the responses of the interviewee that sustainability does not have a priority now and will not have a priority in the near future due to the tight financial situation were not encouraging. The data also showed that more actions regarding sustainability would be taken if the economic situation were better in the LUMC. From the researchers' point of view, this is too late. Every day that action is delayed, unnecessary waste that harms the environment is generated. It is important to educate those who are in charge of the finances at LUMC to be aware of the long term cost savings realised when implementing sustainability measures described in research by van Straten et al. (2021).

"*An ED interviewee who has quite some power in decision-making in the management of the ED mentioned that this was the first time talking and thinking about this subject of sustainability. This made me wonder: why am I, a 22-year-old master's student, the first person to whom you are talking about this subject? I thought this was a subject that was more alive than this at the moment. However, I am so grateful that I may research this*

subject because the interviewee also said during the interview that the interview might change the mindset, and new actions may be taken afterwards. I am curious if this will happen, but I will see!" – Reflexive journal, April 2022

As was mentioned by the interviewees, in this research, talking about sustainability and focusing attention on it will help raise awareness about the importance of environmental sustainability and may lead to actions in the ED. Wiek et al. (2011) mentioned that education about sustainability might be an effective solution to help hospitals become more sustainable than now. To think further in educational terms, small interventions, such as photo dialogues, may also help discuss the subject in an approachable manner.

In figure 4, the relations between the themes discussed previously are represented. In this figure, the themes are interconnected, with reflexive space as the central element of this research, while combining information from the first-person inquiry, which arose from reflexive journaling, second-person inquiry, which originated from conducting interviews, and third-person inquiry, which emerged from participatory research and engaging the wider community by sharing the photos of the photo dialogue. When this figure is used in daily practice at the ED to increase sustainability, it might be helpful to change the healthcare system; for instance, via raising awareness, engaging all actors in healthcare, learning from other departments' sustainable actions and implementing these at the ED, overcoming barriers, changing policies and using photo dialogues. All in all, changing the system starts with yourself as an individual, but to make the whole ED system more sustainable, collaboration throughout the entire system will be needed, for instance, through LUMC Green Teams.

Figure 4

Themes and relations between the themes

5.2 Conclusion

In terms of the main research question: "*How can the emergency department become more environmentally sustainable?*" raising awareness in the ED, which conducting this research did, is the first step. When more attention is given to sustainability, more awareness will be created, and people will act more sustainably by thinking twice before throwing something away. Raising awareness might be performed through photo dialogues, education or continuous one-on-one dialogues about the subject by designating an individual as the point person (Cunliffe, 2002; Wiig et al., 2021). Including different parties, such as the purchasing department, the board of directors, the politicians, the manufacturers and the cleaning service, when implementing sustainable actions is essential. They are interconnected in and around the

ED of the LUMC, and to regreen the ED; it is necessary that ED and LUMC management placed a high priority on environmental sustainability, giving financial support and time allotment to employees to come up with initiatives. As mentioned in figure 4 from section 5.1.4, the collaboration of all actors in healthcare is crucial while taking reflexive space into account because change begins with the individuals' mindset about sustainability. Moreover, the clinical practices mentioned in figure 3 from section 2.4, such as giving education about the 4 R and 10 R approach, increasing focus on preventive medicine, combining top-down and bottom-up approaches and increasing awareness about the consequences of incorrect sorting, should be implemented to grow environmental sustainability. Collaboration on a national level to change policies regarding sustainability in healthcare and within a hospital regarding learning from each other between divisions is needed to become more sustainable, keeping patient safety in mind and the planet's safety.

5.3 Limitations of this study

The LUMC consists of 8.800 employees, of which I interviewed a small sample of 14, putting the external validity of my research into question. However, the interviewees were chosen carefully. The major part (n=8) of the interviewees were people from the ED to receive the perspective from the department where my research was focused, and the other part (n=6) were interviewees working elsewhere in the LUMC. The researcher chose to get know-how from other departments in LUMC that are addressing sustainability. In addition to the interviews conducted, a reflexive research journal was kept, which made the external validity of the observations, results and conclusions more confident regarding the external validity. Moreover, many themes discussed among the interviewees were shared, which allowed the researcher to generate general statements and findings (see Appendix 8). Throughout the selection of the quotes, it was sometimes difficult to select which quotes to include in this research. This was due to the fact that some of the quotes generally had similar meanings. The quotes were selected based on their clarity.

As an insider researcher, it was exciting but challenging to perform this study at my workplace; for instance, I noticed that it was sometimes difficult to treat everyone the same because of my colleagues' different ties. However, I tried to be as neutral as possible towards various actors during my research. Therefore, this might also be a limitation for this research because I might have been less objective and sometimes more subjective during interviews due to my own experiences and sustainable thoughts at the ED.

For this research, it would have been ideal to interview individuals from different specialities of the LUMC separately to receive a complete view of the other actions that have been taken in the LUMC. However, this was not possible due to the scope of this research and specific time constraints. Different actors were asked for interviews to prevent only people interested in the topic of sustainability were questioned.
All in all, I had a good sense of data saturation since the data derived from the interviews was rich enough to keep this research as direct and concise as possible.

5.4 Reflexive researcher contribution

Reflecting on the previous months during which I performed this research, I encountered many new insights. Throughout the research process, I learned a lot about conducting qualitative research, a form of research that I was not familiar with. In addition, I used my creativity to set up a photo exposition, which I used for my thesis, and this taught me another form of research, to increase awareness about a subject. I am grateful to have the opportunity to perform this research and share my photos with the broader community at the Dutch North Sea Emergency Medicine Conference. Through this third-person inquiry, as the wider community is involved through newspapers, photo dialogues and other media platforms, the action research has been expanded to reach a broader audience giving rise to the message of the urgency of raising awareness about sustainability. Participating in the Sustainable Hospitals Lab allowed me to learn more about the LUMC as a system and the latest sustainable actions in healthcare. Also, being invited to write an editorial in a leading clinical journal, the European Journal of Trauma and Emergency Surgery, was an honour and a confirmation of the quality and interest in my research.
Overall, it was inspiring to perform this research, and I hope it will contribute to growing awareness of environmental sustainability at the ED. Moreover, due to using a reflexive journal, I could interrogate with choices made during interviews. In section 5.5, I will give some recommendations for further research.

"*I just received an e-mail from John Barker, he is a professor of Experimental Orthopedics and Trauma Surgery, and he invited me to write an editorial with him about sustainability for the famous International Journal of Trauma and Emergency Surgery because he heard from Maria Koijck about the research I am performing about sustainability at the ED. This feels like such an honour, it's unbelievable.*" – Reflexive journal, May 2022

5.5 Recommendations for further research

As mentioned before, only 14 interviews were conducted in the LUMC. To obtain a broader perspective of the overall awareness of environmental sustainability at LUMC, further research that interviews individuals from all specialities and with different functions in the LUMC might be interesting.

Furthermore, the photo dialogue could be expanded to include photos of other departments and kinds of interventions while naming how many products are used for that single intervention to make people more aware of environmental sustainability. The photos used in this research will be presented at different EDs in the Netherlands and will remain for eight weeks at every ED.

In addition, an interview with the care magazine, Zorgvisie is planned for June 2022 to share this research with the wider community. This can be seen as a third-person inquiry. With the goal of heightening the awareness of environmental sustainability to a wider medical audience in the following months, this research will be written up in the form of an editorial and published in a top clinical journal.

In table 1, a beginning of a literature review has been performed, which could be expanded in further studies. Another idea to expand this research is to conduct a study focused on assessing the amount of money saved through particular sustainable implementations. The findings of this study can be used to convince hospital management that becoming more sustainable does not necessarily cost more money.

Hopefully, through these further actions, environmental sustainability will become a higher priority in the minds of this important part of the hospital decision chain. These efforts are part of a growing movement to heighten awareness of environmental sustainability in a broad community that will hopefully lead to real change (figure 4).

Figure 4

Photo exposition at the Dutch North Sea Emergency Medicine Conference in Egmond aan Zee, 2nd of June 2022 (van Ee, 2022)

References

Addis, M. (2016). Tacit and explicit knowledge in construction management. *Construction Management and Economics*, 34(7–8), 439–445. Retrieved from https://doi.org/10.1080/01446193.2016.1180416

Azouz, S., Boyll, P., Swanson, M., Castel, N., Maffi, T., & Rebecca, A. M. (2019). Managing barriers to recycling in the operating room. *The American Journal of Surgery*, 217(4), 634–638. Retrieved from https://doi.org/10.1016/j.amjsurg.2018.06.020

Bhayana, K., Rehan, H., & Arora, T. (2016). Comparison of the knowledge, attitude, and practices of doctors, nurses, and pharmacists regarding the use of expired and disposal of unused medicines in Delhi. *Indian Journal of Pharmacology*, 48(6), 725. Retrieved from https://doi.org/10.4103/0253-7613.194846

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member Checking. *Qualitative Health Research*, 26(13), 1802–1811. Retrieved from https://doi.org/10.1177/1049732316654870

Bradbury, H. (2015). *The SAGE Handbook of Action Research*. 1 Oliver's Yard, 55 City Road London EC1Y 1SP : SAGE Publications Ltd. Retrieved from https://doi.org/10.4135/9781473921290

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. Retrieved from https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2013). Successful Qualitative Research: A Practical Guide for Beginners. *SAGE Publications Ltd.*

Bruin, J. de, Houwert, T., & Merkus, K. (2019). Een stuur voor de transitie naar duurzame gezondheidszorg. *Gupta Strategists*.

Cabello, F. C. (2006). Heavy use of prophylactic antibiotics in aquaculture: a growing problem for human and animal health and for the environment. *Environmental Microbiology*, 8(7), 1137–1144. Retrieved from https://doi.org/10.1111/j.1462-2920.2006.01054.x

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. J. (2014). The Use of Triangulation in Qualitative Research. *Oncology Nursing Forum*, 41(5), 545–547. Retrieved from https://doi.org/10.1188/14.ONF.545-547

Centre for Sustainability. (2021). Interdisciplinary Thesis Lab: Sustainable Hospitals by Medical Delta. Retrieved January 9, 2022, from https://www.centre-for-sustainability.nl/for-students/interdisciplinary-thesis-labs/interdisciplinary-thesis-lab-sustainable-hospitals-by

Circular Academy. (2022). Circular economy: some definitions. Retrieved May 2, 2022, from http://www.circular.academy/circular-economy-some-definitions/

Cockerham, M., Haverland, A., & Solvang, N. (2016). Battling Supply Waste in the ICU: A Bedside Cart Standardization Project. *Journal of PeriAnesthesia Nursing*, 31(1), 89–94. Retrieved from https://doi.org/10.1016/j.jopan.2015.11.003

Coghlan, D., & Brannick, T. (2019). Doing research in your own organisation. *Sage Publications Ltd*.

Coleman, G. (2018). Action Research. In *Methodologies for Practice Research Proofs* (Vol. 1, pp. 151–169).

Cotter, R. J. (2014). Reflexive spaces of appearance: rethinking critical reflection in the workplace. *Human Resource Development International*, 17(4), 459–474. Retrieved from https://doi.org/10.1080/13678868.2014.932090

Cunliffe, A. L. (2002). Reflexive Dialogical Practice in Management Learning. *Management Learning*, 33(1), 35–61. Retrieved from https://doi.org/10.1177/1350507602331002

Dale, A., & Newman, L. (2005). Sustainable development, education and literacy. *International Journal of Sustainability in Higher Education*, 6(4), 351–362. Retrieved from https://doi.org/10.1108/14676370510623847

Doyle, S. (2007). Member Checking With Older Women: A Framework for Negotiating Meaning. *Health Care for Women International*, 28(10), 888–908. Retrieved from https://doi.org/10.1080/07399330701615325

Drotz, E., & Poksinska, B. (2014). Lean in healthcare from employees' perspectives. *Journal of Health Organization and Management*, 28(2), 177–195. Retrieved from https://doi.org/10.1108/JHOM-03-2013-0066

Edwards, S. (2015). *Business Management Handbook: A Primer on Sustainable Business*. Blurb.

Environmental Protection Agency (EPA). (1995). Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Medical Waste Incinerators. *Federal Register*.

Friedericy, H., Beelen, M., Eijk van der, A., & Jansen, F. W. (2020). Zo vermindert het LUMC z'n CO2-voetafdruk. *Medisch Contact*, 14–17.

Harris, H., Bhutta, M. F., & Rizan, C. (2021). A survey of UK and Irish surgeons' attitudes, behaviours and barriers to change for environmental sustainability. *Annals of Surgery*, 103(10), 725–729. Retrieved from https://doi.org/10.1308/rcsann.2021.0271

Joseph, B., James, J., Kalarikkal, N., & Thomas, S. (2021). Recycling of medical plastics. *Advanced Industrial and Engineering Polymer Research*, 4(3), 199–208. Retrieved from https://doi.org/10.1016/j.aiepr.2021.06.003

Kim, Y. H., Sting, F. J., & Loch, C. H. (2014). Top-down, bottom-up, or both? Toward an integrative perspective on operations strategy formation. *Journal of Operations Management*, 32(7–8), 462–474. Retrieved from https://doi.org/10.1016/j.jom.2014.09.005

Kleber, J., & Cohen, B. (2020). Reducing Waste and Increasing Sustainability in Health Care Settings. *AJN, American Journal of Nursing*, 120(4), 45–48. Retrieved from https://doi.org/10.1097/01.NAJ.0000660032.02514.ec

Kümmerer, K. (2009). The presence of pharmaceuticals in the environment due to human use – present knowledge and future challenges. *Journal of Environmental Management*, 90(8), 2354–2366. Retrieved from https://doi.org/10.1016/j.jenvman.2009.01.023

Linstadt, H., Collins, A., Slutzman, J. E., Kimball, E., Lemery, J., Sorensen, C., … Auerbach, P. S. (2020). The Climate-Smart Emergency Department: A Primer. *Annals of Emergency Medicine*, 76(2), 155–167. Retrieved June 4, 2022 from https://doi.org/10.1016/J.ANNEMERGMED.2019.11.003

Marimuthu, M., & Paulose, H. (2016). Emergence of Sustainability Based Approaches in Healthcare: Expanding Research and Practice. *Procedia - Social and Behavioral Sciences*, 224, 554–561. Retrieved from https://doi.org/10.1016/j.sbspro.2016.05.437

Marshall, J. (2004). Living systemic thinking Exploring quality in first-person action research. Retrieved from https://doi.org/10.1177/1476750304045945

Marshall, S. (2014). Photo-Dialogue: creating the word-image that makes the difference. *The Change Doctors*.

McGain, F., & Naylor, C. (2014). Environmental sustainability in hospitals – a systematic review and research agenda. *Journal of Health Services Research & Policy*, 19(4), 245–252. Retrieved from https://doi.org/10.1177/1355819614534836

McHugh, S. K., Lawton, R., O'Hara, J. K., & Sheard, L. (2020). Does team reflexivity impact teamwork and communication in interprofessional hospital-based healthcare teams? A systematic review and narrative synthesis. *BMJ Quality & Safety*, 29(8), 672–683. Retrieved from https://doi.org/10.1136/bmjqs-2019-009921

Meyer, K., & Willis, R. (2019). Looking Back to Move Forward: The Value of Reflexive Journaling for Novice Researchers. *Journal of Gerontological Social Work*, 62(5), 578–585. Retrieved from https://doi.org/10.1080/01634372.2018.1559906

Molero, A., Calabrò, M., Vignes, M., Gouget, B., & Gruson, D. (2021). Sustainability in Healthcare: Perspectives and Reflections Regarding Laboratory Medicine. *Annals of Laboratory Medicine*, 41(2), 139–144. Retrieved from https://doi.org/10.3343/alm.2021.41.2.139

Mortelmans, D. (2013). *Handboek kwalitatieve onderzoeksmethoden* (2nd ed.). Leuven: Acco.

Naranjo-Gil, D. (2016). The role of management control systems and top teams in implementing environmental sustainability policies. *Sustainability (Switzerland)*, 8(4). Retrieved May 12, 2022 from https://doi.org/10.3390/SU8040359

Ngo, H. (2020). How do you fix healthcare's medical waste problem? Retrieved February 19, 2022, from https://www.bbc.com/future/article/20200813-the-hidden-harm-of-medical-plastic-waste-and-pollution

Noble, H., & Heale, R. (2019). Triangulation in research, with examples. *Evidence Based Nursing*, 22(3), 67–68. Retrieved from https://doi.org/10.1136/ebnurs-2019-103145

Orb, A. , E. L. , W. D. (2000). Ethics in Qualitative Research. Retrieved February 24, 2022, from http://www.columbia.edu/~mvp19/RMC/M5/QualEthics.pdf

Ortlipp, M. (2015). Keeping and Using Reflective Journals in the Qualitative Research Process. *The Qualitative Report*. Retrieved from https://doi.org/10.46743/2160-3715/2008.1579

Ossebaard, H. C., ten Have, P., van Hal, P. Th. W., Wichers, I., Kooistra, J., Hagedoorn, P., … de Heer, P. (2021). Turning green: the impact of changing to more eco-friendly respiratory healthcare. A carbon and cost analysis of Dutch prescription data. Retrieved December 3, 2021 from https://doi.org/https://doi.org/10.1101/2021.11.20.21266571

Philipsborn, R. P., Sheffield, P., White, A., Osta, A., Anderson, M. S., & Bernstein, A. (2021). Climate Change and the Practice of Medicine: Essentials for Resident Education. *Academic Medicine*, 96(3), 355–367. Retrieved from https://doi.org/10.1097/ACM.0000000000003719

Polivka, B. J., Chaudry, R. v., & mac Crawford, J. (2012). Public Health Nurses' Knowledge and Attitudes Regarding Climate Change. *Environmental Health Perspectives*, 120(3), 321–325. Retrieved from https://doi.org/10.1289/ehp.1104025

Reike, D., Vermeulen, W. J. V., & Witjes, S. (2018). The circular economy: New or Refurbished as CE 3.0? — Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. *Resources, Conservation and Recycling*, 135, 246–264. Retrieved from https://doi.org/10.1016/j.resconrec.2017.08.027

Rijksoverheid. (2019). *Ketenaanpak Medicijnresten uit Water*. Retrieved June 4, 2022 from Den Haag: https://www.rijksoverheid.nl/documenten/beleidsnotas/2019/02/12/ketenaanpak-medicijnresten-uit-water

Riordan, C. M., Vandenberg, R. J., & Richardson, H. A. (2005). Employee involvement climate and organizational effectiveness. *Human Resource Management*, 44(4). Retrieved from https://doi.org/10.1002/hrm.20085

Romanello, M., McGushin, A., di Napoli, C., Drummond, P., Hughes, N., Jamart, L., … Hamilton, I. (2021). The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. *The Lancet*, 398(10311), 1619–1662. Retrieved December 3, 2021 from https://doi.org/10.1016/S0140-6736(21)01787-6

Rombouts, S. (2020). Why Modularity is key to Circularity. Retrieved June 4, 2022, from https://www.firmhouse.com/blog/why-modularity-is-key-to-circularity

Schroeder, K., Thompson, T., Frith, K., & Pencheon, D. (2012). Engaging with Sustainability. In *Sustainable Healthcare* (pp. 50–71). Chichester, UK: John Wiley & Sons, Ltd. Retrieved from https://doi.org/10.1002/9781118342527.ch3

Shah, R., & Ward, P. T. (2003). Lean manufacturing: context, practice bundles, and performance. *Journal of Operations Management*, 21(2), 129–149. Retrieved from https://doi.org/10.1016/S0272-6963(02)00108-0

Singh, P. (2019). Lean in healthcare organization: an opportunity for environmental sustainability. *Benchmarking: An International Journal*, 26(1), 205–220. Retrieved from https://doi.org/10.1108/BIJ-04-2018-0104

Somekh, B., Posch, P., Altrichter, H., & Feldman, A. (2018). *Teachers Investigate Their Work An Introduction to Action Research across the Professions*. Routledge.

Spruell, T., Webb, H., Steley, Z., Chan, J., & Robertson, A. (2021). Environmentally sustainable emergency medicine. *Emergency Medicine Journal*, 38(4), 315–318. Retrieved from https://doi.org/10.1136/emermed-2020-210421

Subramani, S. (2019). Practising reflexivity: Ethics, methodology and theory construction. *Methodological Innovations*, 12(2), 2059799119863276. Retrieved from https://doi.org/10.1177/2059799119863276

Team Zorg voor Klimaat. (2022). Green Team maanden – het LUMC programma Groen en Gezond: de slimme vuilnisbak. Retrieved May 26, 2022, from https://www.zorgvoorklimaat.nl/nieuws/green-team-maanden-het-lumc-programma-groen-en-gezond-de-slimme-vuilnisbak/

Thiel, C., Duncan, P., & Woods, N. (2017). Attitude of US obstetricians and gynaecologists to global warming and medical waste. *Journal of Health Services Research & Policy*, 22(3), 162–167. Retrieved from https://doi.org/10.1177/1355819617697353

Thorogood, N., & Green, J. (2004). *Qualitative methods for health research* (Vol. 4). London: SAGE Publications Inc.

Tricco, A. C., Cogo, E., Ashoor, H., Perrier, L., McKibbon, K. A., Grimshaw, J. M., & Straus, S. E. (2013). Sustainability of knowledge translation interventions in healthcare decision-making: protocol for a scoping review. *BMJ Open*, 3(5), e002970. Retrieved from https://doi.org/10.1136/bmjopen-2013-002970

van Ee, E. (2022, June 2). Dutch North Sea Emergency Medicine Conference. Leiden.

van Straten, B., Dankelman, J., van der Eijk, A., & Horeman, T. (2021). A Circular Healthcare Economy; a feasibility study to reduce surgical stainless steel waste. *Sustainable Production and Consumption*, 27, 169–175. Retrieved from https://doi.org/10.1016/j.spc.2020.10.030

Verderber, S. (2010). *Innovations in Hospital Architecture* (1st ed.). New York: Routledge.

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science*, 6(2), 203–218. Retrieved from https://doi.org/10.1007/s11625-011-0132-6

Wiig, S., Aase, K., & Bal, R. (2021). Reflexive Spaces: Leveraging Resilience Into Healthcare Regulation and Management. *Journal of Patient Safety*, 17(8). Retrieved

from https://journals.lww.com/journalpatientsafety/Fulltext/2021/12000/Reflexive_Spaces__Leveraging_Resilience_Into.137.aspx

World Health Organisation. (2017). Environmentally sustainable health systems: a strategic document. *World Health Organization*. Regional Office for Europe.

Appendices

Appendix 1: Topic list

1. Permission
2. Explanation of interview according to topic list
3. Sustainability
    a. The current situation from the respondents' point of view
    b. What is going well
    c. What can be improved
    d. What is the role of management and organisation
4. Awareness
    a. About sustainability
    b. How to raise awareness
5. Reflexive space
    a. Creating a dialogue
    b. Photo journaling
6. Change
    a. Openness to change
    b. Switches from disposable to reusable
    c. Who are involved
    d. What would the respondent change to become more sustainable
    e. What are potential barriers to implement more sustainability
    f. What do you need to improve sustainability
    g. Where in 2030
7. Question: do you want to add something else/ have I missed something
8. Feedback
9. End of interview

Appendix 2: Interview respondents' information (coded)

Seen below is the list of respondents included in this thesis. The respondents are coded according to the following coding scheme. The first letter indicates the type of respondent. There are two types of respondents:

- The respondent who works at the ED of the LUMC, indicated by "ED"
- The respondent who works at another department than the ED in the LUMC, indicated by "LUMC"

The number after the letter code indicates which participant it involves. Based on this coding scheme, the following respondent list is created:

Respondent	Code	Gender	Length of interview (in minutes)
1	SEH1	Male	36,50
2	SEH2	Female	44,13
3	SEH3	Female	46,40
4	SEH4	Female	30,06
5	SEH5	Female	26,30
6	SEH6	Male	43,56
7	SEH7	Female	36,24
8	SEH8	Male	36,19
9	LUMC1	Female	37,44
10	LUMC2	Female	36,08
11	LUMC3	Male	32,11
12	LUMC4	Male	37,00
13	LUMC5	Female	53,15
14	LUMC6	Female	31,16

Appendix 3: Confidentiality clause

1. I will be recording the interviews using voice-over (if online: Microsoft Teams) in order to interpret the data at a later stage.
2. I will convert to audio format and create a transcription file.
3. All the data will be kept under password protection on my computer.
4. My thesis submission requires that the audio files are submitted securely so that my thesis supervisor is able to view the recordings if necessary.
5. My thesis supervisor, the grading committee and I are the only people who will have access to the recordings. Your identity will not be known to anyone other than me.
6. I will send you a copy of the data afterwards in case you want to go through it and prohibit use of data that was collected.
7. Are you fine with being interviewed and your data being used as I have described?

Appendix 4: Endpoints of the interviews

1. To identify the current state of awareness of environmental sustainability in the emergency department;
2. To identify who in the hospital are involved in raising awareness about environmental sustainability;
3. To identify which sustainable actions about environmental sustainability are available in the LUMC;
4. To identify how reflexive spaces might contribute to growing environmental sustainability in the emergency department.

Appendix 5: Phases of thematic analysis

Phase	Description of the process
1. Familiarizing yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Appendix 6: List of axial codes

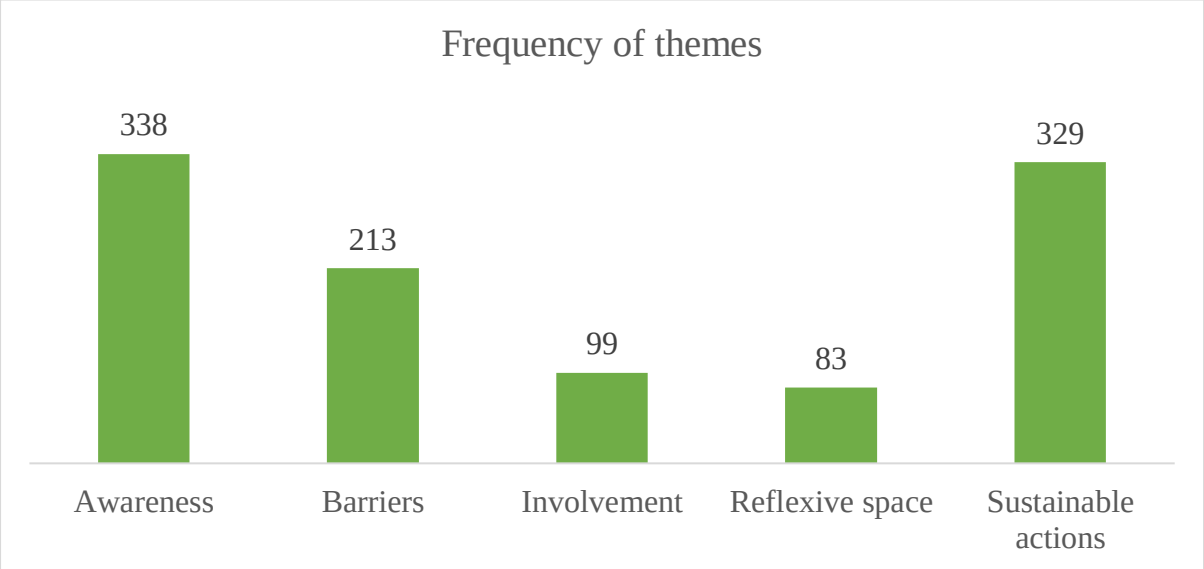
Axial codes	Frequency in interviews
Awareness: ED	82
Awareness: elsewhere	11
Awareness: how to raise?	81
Awareness: LUMC	39
Bottom-up approach	26
Ignorance	5
Management & organisation involvement	89
Photo-journaling	9
Potential barriers	191
Reflexive space	59
Sustainability: options for change	183
Sustainable actions: ED	60
Sustainable actions: elsewhere	19
Sustainable actions: LUMC	72
Where in 2030?	21
Who involved in hospital	54

Appendix 7: Code scheme themes interviews ATLAS.ti

Themes	Codes	Goals
Awareness	*Awareness: ED, awareness: elsewhere, awareness: how to raise?, awareness: LUMC, ignorance, sustainable actions: ED, sustainable actions: LUMC, where in 2030?*	Text is being coded when it relates to the current state of awareness of environmental sustainability in the ED, LUMC or elsewhere.
Involvement	*Bottom-up approach, management & organisation, who involved in hospital, where in 2030?*	Text is being coded when it relates to people who are involved in changing sustainability in the hospital.
Barriers	*Potential barriers, ignorance, where in 2030?*	Text is being coded when a barrier is indicated that in any way or form can complicate or postpone sustainability.
Reflexive space	*Reflexive space, photo-journaling*	Text is being coded when it shows a form of reflexivity or reflexive space, or when it describes the implications of this.
Sustainable actions	*Sustainability: options for change, sustainable actions: ED, sustainable actions: elsewhere, sustainable actions: LUMC, where in 2030?*	Text is being coded when it shows a factor that can lead to more sustainable options, or the current sustainable actions.

Appendix 8: Frequency of codes per respondent

Respondent/ Code	Awareness	Barriers	Involvement	Reflexive space	Sustainable actions	Totals
ED1	28	39	12	18	33	130
ED2	31	14	5	4	33	87
ED3	28	17	6	8	25	84
ED4	34	18	11	6	28	97
ED5	27	21	11	7	30	96
ED6	30	21	5	14	39	109
ED7	34	15	4	2	23	78
ED8	20	15	10	5	23	73
LUMC1	18	10	4	4	25	61
LUMC2	20	6	9	2	25	62
LUMC3	12	6	7	2	5	32
LUMC4	15	8	4	2	8	37
LUMC5	27	14	6	4	21	72
LUMC6	14	9	5	5	11	44
Totals	338	213	99	83	329	1062



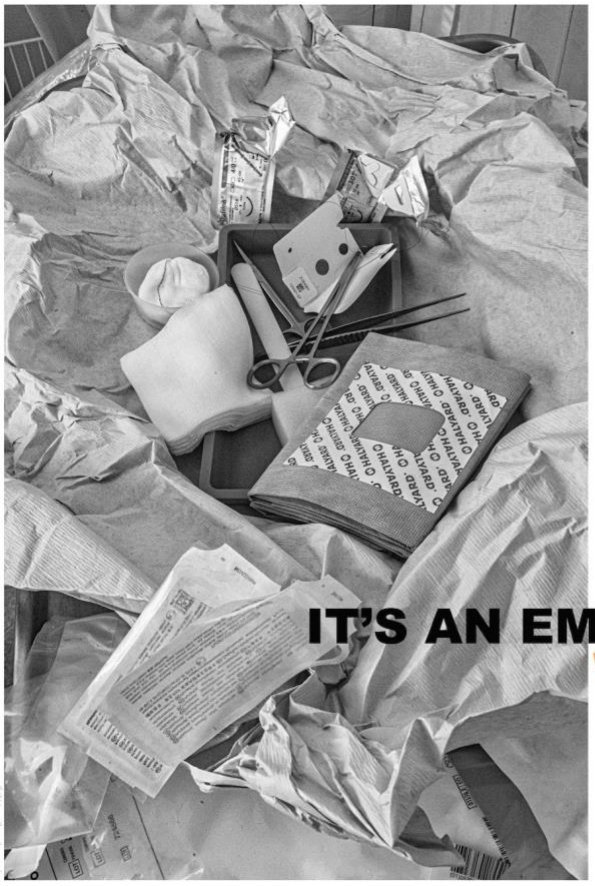
Appendix 9: Photos for photo dialogue

IT'S AN EMERGENCY!

Patient survived. What about the planet?

IT'S AN EMERGENCY!

How many IV's does our planet need?


IT'S AN EMERGENCY!
What do we need to stitch?


IT'S AN EMERGENCY!
Do we need a package deal,
or not?

IT'S AN EMERGENCY!

Plastic wildlife for our children?