Improving neonatal resuscitation: ethical aspects

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GENERAL INTRODUCTION

BACKGROUND AND AIMS OF THIS THESIS

Adapting from foetal to neonatal life is a complex physiological transition that probably requires the most substantial physiological changes that occur in life. Although most neonates adapt to these changes without assistance, about 10% of neonates require some form of support at birth(1), corresponding with yearly approximately 10 million babies requiring support worldwide(2). This support mostly consist of simple interventions, such as tactile stimulation or airway positioning or clearing, but 3% of all neonates require assisted ventilation, and 1% require endotracheal intubation or cardiac resuscitation.(3) In this thesis, the set of interventions to support the transitioning neonate will be referred to as neonatal resuscitation[3]. The key to successful neonatal resuscitation often is effective respiratory support. There is increasing evidence that providing inappropriate respiratory support can have severe consequences.(3, 4) Improving neonatal resuscitation performance can thus save lives and reduce morbidities.(5, 6)

Worldwide, approximately 15 million babies are born prematurely.(7) Of these, approximately 11,3% are born at a gestational age between 28 and 32 weeks (very preterm) and approximately 4,1% at a gestational age of less than 28 weeks (extremely preterm)(8), corresponding with approximately 2.3 million babies born at a gestational age of less than 32 weeks. A lower gestational age at birth is associated with an increased need of support, with up to 85% of extremely preterm infants requiring interventions at birth.(9) Furthermore, also the level of support that may be required is inversely related to the gestational age of the infant.(10) The increased need and intensity of support in very and extremely preterm neonates can be explained by the fact that transition from foetal to neonatal life is complicated by immaturity of many organ systems. Supporting these infants therefore requires (slightly) other strategies than supporting term neonates.(6) Just as many others, neonatal care providers working at the neonatal intensive care unit (NICU) of the Leiden University Medical Center (LUMC) participate in various activities to learn more about the best possible care for these very and extremely preterm neonates.

[3] As neonatal care providers at the LUMC strive to provide non-invasive care during neonatal transition, 'neonatal stabilization' may be more accurate to refer to the interventions performed to support most transitioning neonates. However, as 'neonatal resuscitation' is more commonly used in the international literature, this term will be used in this thesis.

IMPROVING NEONATAL RESUSCITATION

In 1880, obstetrician Robert Bruce reported how he introduced a specially made curved tube into the larynx of a term, non-vigorous neonate to perform artificial respiration for 35 minutes, after which natural respiration was established.(11) Since the 1940s, various papers reported methods to support breathing at birth, with Wilson and Roscoe reporting outcomes of one of the first controlled studies on neonatal resuscitation of preterm infants in 1958.(12) Theoretical knowledge about neonatal resuscitation is then rapidly advancing. However, improving neonatal resuscitation not solely requires improving theoretical knowledge, but also adapting clinical management. Establishment of guidelines for neonatal resuscitation was thus recommended, as well as the development of curriculums to teach these guidelines to neonatal care providers.(13) Efforts to do so resulted in international collaborations seeking consensus about neonatal resuscitation and evaluating evidence underpinning current practice. Doing so revealed that even after all this years, robust evidence for neonatal resuscitation interventions is still lacking.(14) Continued efforts to study and improve neonatal resuscitation are therefore needed.(13)

STUDY AIMS AND RESEARCH QUESTIONS

This thesis aims to explore some of the ethical challenges of studying and improving neonatal resuscitation by means of studying two cases: consent for delivery room (DR) studies and recording and reviewing neonatal resuscitation. The central research question of this thesis is: What are the ethical challenges of consent for DR studies and recording and reviewing neonatal resuscitation? In order to answer the central research question, various subquestions will be addressed, focused on stakeholders' perceptions on these issues. For example: how do neonatal care providers experience participating in recording and reviewing neonatal resuscitation? And how do parents experience being approached for consent for DR studies? By combining empirical research with ethical reasoning, this thesis aims to provide more insight in existing ethical challenges and guidance for the ethical conduct of initiatives aimed at studying and improving neonatal resuscitation. As such it aims to contribute to improving neonatal resuscitation.

METHODS

The importance of empirical research in bioethics is more and more recognized, as by combining ethical reasoning with empirical research, moral problems can be better addressed. Empirical data may enrich ethical reasoning as it may provide information about the moral principles that are most at stake in a given context. Furthermore, insight in the given context may generate new normative concerns. Moreover, empirical data may enable the development of concrete means to realize ethically justifiable behavior.(15) In this thesis ethical reasoning will be combined with empirical research by using empirical data in a so-called Reflective Equilibrium.

REFLECTIVE EQUILIBRIUM

The method of Reflective Equilibrium (RE) was developed by John Rawls in 1971(16) and consists of working back and forth among considered moral judgments about particular cases, the principles that govern these judgments, and the theoretical considerations behind the considered judgments and principles.(17) Various versions of the RE have been used to solve moral problems.(18) For the present study, the RE as described by de Vries and van Leeuwen(19) will be leading. This version of the RE is adjusted from the Network Model of van Willigenburg and Heeger(20) that added morally relevant facts to the RE, and additionally includes background theories and moral experiences of third persons, i.e. the individual people in the specific context, derived from empirical research (see figure 1). By adding empirical data in the RE, the risk of self-justification and bias can be reduced and the credibility of the reached RE can be increased.(19) It furthermore respects the moral wisdom of involved stakeholders.(21)

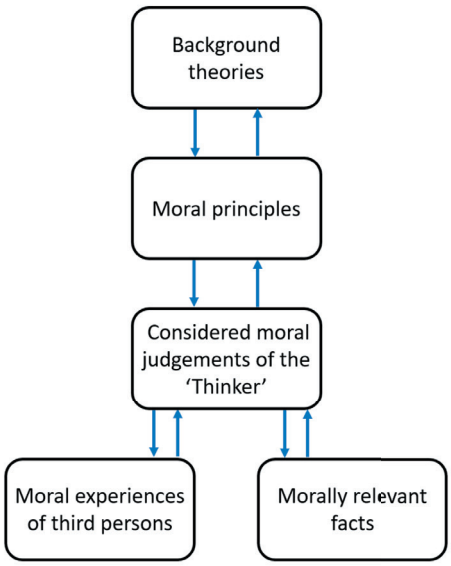

Figure 1. Model for Reflective Equilibrium used in the present study, based on De Vries and Van Leeuwen (2010).

THE CASES

CONSENT FOR DR STUDIES

For many years, neonatal care providers of the NICU of the LUMC have been involved in activities to improve neonatal resuscitation, with various DR studies being conducted since 2005. Conducting DR studies is important, as evidence regarding the best care for neonates that require interventions at birth is often lacking or of poor quality.(14) However, conducting DR studies can be ethically challenging. Approaching parents faced with an imminent premature birth for research participation can be burdensome(22) and the validity of consent obtained from emotionally and physically distressed parents can be challenged.(23, 24) Many parents will be approached unnecessarily, as their infants never become eligible for the specific DR studies, reflecting an unnecessary burden on both parents and research personnel.(25) In emergency situations, however, time to approach parents for research consent is often lacking, and neonates born in these situations are therefore often excluded from DR studies. As infants requiring resuscitation in an emergency situation are at the highest risk of a poor outcome, excluding these neonates is undesirable, as this

would result in selection bias.(26, 27) In order to manage challenges of this prospective consent approach, guidelines on conducting studies using a deferred consent approach were established. A deferred consent approach implies that neonates can be enrolled in a DR study without parental consent. As soon as reasonably possible, parents are informed and approached for their permission to continue their infant's study participation and to use already obtained data.(28)

In 2008, the NICU of the LUMC firstly used a deferred consent approach for a DR study.(29) Since then, various DR studies have been conducted using a deferred consent approach when time to approach parents for research consent was lacking, or approaching of parents for research consent was considered inappropriate.(30-33) The actual usage of a deferred consent approach raised various questions. For instance: when exactly is approaching parents inappropriate? How do providers experience approaching parents for deferred consent? How do parents consider being approached for deferred consent? These and other questions will be explored in this thesis.

RECORDING AND AUDITING[4] NEONATAL RESUSCITATION

In 2009, the NICU of the LUMC implemented recording neonatal resuscitation for research purposes. Recordings capture various vital parameters and imaging of the neonate and the providers' hands (see figure 2).

Recording neonatal resuscitation resulted in various insights in neonatal resuscitation, including what happens during manual inflations(34), the effects of sustained inflations(35), and physiological parameters during ventilation by mask or nasal tube(36). Evaluating recordings of neonatal stabilization revealed that providers frequently diverge from the prevailing guidelines and that mask technique is often inadequate.(37) Comparing recordings with the medical record furthermore revealed that documentation in the medical record is often incomplete or inaccurate.(38) In order to improve the quality of care provided during neonatal resuscitation and the documentation in the medical record, weekly plenary audits reviewing recordings of neonatal resuscitation were implemented in 2014. During audits, for which all NICU staff members are invited, provided care is reviewed, discussing, amongst others, mask technique, compliance to the prevailing local guideline, and clinical decision-making and alternative treatment options.

[4] In this thesis, the term 'audit' refers to the regular plenary meeting in which recordings of neonatal resuscitation are reviewed and discussed.

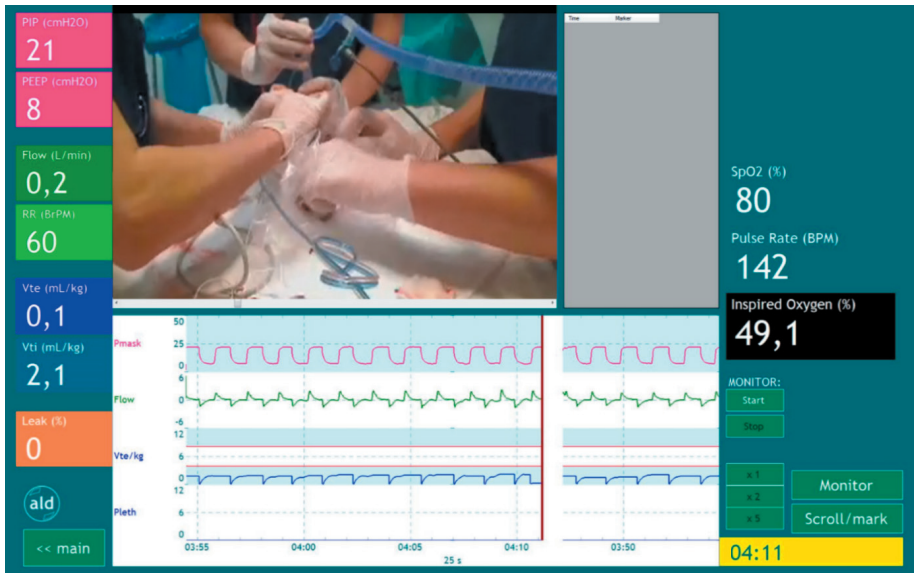

Figure 2. Recording neonatal resuscitation at the LUMC

Although the NICU of the LUMC successfully implemented recording and auditing neonatal resuscitation, implementation can be complicated due to various ethical dilemmas. For instance, should providers and parents consent to the recordings? How to deal with the privacy of the providers, the neonate and parents? Could recordings be stored to use them for further research, or should recordings be deleted after initial use? And what would be the legal status of recordings in court? These and other ethical challenges of recording and auditing neonatal resuscitation will be addressed in this thesis.

Using RE for the two cases, consent for DR studies and recording and auditing neonatal resuscitation, this thesis explores the moral landscape of improving neonatal resuscitation. These cases are exemplary for the complexity of the context of improving neonatal resuscitation. In the case of consent for DR studies, a fairly settled body of norms exists, however, appealing to these norms create new ethical challenges. Appealing to existing norms thus does not lead to a balanced moral practice. In contrast, guidelines for recording and auditing neonatal resuscitation fall short, resulting in questions about the moral justification for the practice. Thus, for both cases, coherence between theory and practice is lacking. In the present study, the moral experiences of third persons will be explored. By doing so, this thesis aims

to provide more insight into existing tensions between theory and practice and in how these tensions could be addressed in order to offer scope for the ethical conduct of a great variety of activities to study and improve neonatal resuscitation.

BACKGROUND THEORIES, MORAL PRINCIPLES AND MORALLY RELEVANT FACTS

Background theories provide the normative background of the principles used within a RE.(19) Theories that might be of importance in the context of improving neonatal resuscitation are theories of professionalism, theories of the child's best interest and theories of research with vulnerable populations. Moral principles that might be relevant are the four principles of biomedical ethics(39) - non-maleficence, beneficence, autonomy and justice-, as well as voluntariness, vulnerability and informed consent. Morally relevant facts are facts that can justifiably be called upon as a reason to support a particular moral judgement.(40) For improving neonatal resuscitation, morally relevant facts might be outcomes after providing neonatal resuscitation, the lack of robust evidence for DR interventions, and guidelines on providing active care to extremely preterm infants. By going back and forth between theory and practice, insight will be provided in whether these and/or other background theories, moral principles and morally relevant facts are relevant for furthering the practice of improving neonatal resuscitation.

MORAL EXPERIENCES OF THIRD PERSONS

Various stakeholders are affected by ethical challenges of improving neonatal resuscitation, including the neonate, parents and providers. Obviously, moral experiences of neonates cannot be studied. Therefore, this thesis solely explores the moral experiences of parents and neonatal care providers. In order to cover a range of potentially relevant perspectives, a qualitative bicentre project was performed at two NICUs: the NICU of the LUMC in Leiden, the Netherlands, and the NICU of the Hospital of the University of Pennsylvania (HUP), in Philadelphia, United States of America. These NICUs regularly participate in the same DR studies, but differ in their consent approaches. Furthermore, both NICUs conduct regular plenary audits of neonatal resuscitation, however, the way in which neonatal resuscitation is recorded diverges: the LUMC records video of providers' hands and various physiological parameters, whereas the HUP records only a limited number of physiological parameters, but both audio and video from two angles (see Chapter 5, figure 1). The research project was approved by the Ethics Review Committee of the LUMC.

Data was collected through two qualitative research methods: participant observations and semi-structured in-depth interviews. At both centres, participants observations were conducted, and neonatal care providers were invited to participate in semi-structured interviews exploring their experiences with and perceptions of recording and reviewing neonatal resuscitation and consent for DR studies. Additionally, parents of very and extremely premature infants admitted to the NICU of the LUMC were invited to participate in semi-structured interviews exploring their perceptions of and experiences with reviewing recordings of the neonatal resuscitation of their infant and consent for DR studies.

All observations and interviews were conducted by the author of this thesis. Consistent with standard qualitative research techniques, interviews were performed using topic lists that were adapted through an iterative process to ensure that the questions captured all relevant emerging themes.(41) Inclusion of participants continued until thematic saturation(42) was reached. In consistence with standards in qualitative research, participant observations were reported in field notes.(43)

Interviews with providers were conducted at the hospital and lasted between 24 and 93 minutes. Topics included demographics, perceptions of and experiences with recording and reviewing neonatal resuscitation, perceptions of the goal of recording and reviewing neonatal resuscitation, educational benefits of recording and reviewing neonatal resuscitation, impact of being recorded and reviewed, recording and reviewing neonatal resuscitation as a tool for transparency, parental involvement in recording and reviewing neonatal resuscitation and deferred consent for DR studies. An overview of participant characteristics can be found in table 1.

Interviews with parents lasted between 43 and 94 minutes and were conducted at the hospital or at the parents' home. Topics included demographics, experiences with and perceptions of reviewing recordings of the neonatal resuscitation of their infant, perceptions of improving the quality of neonatal resuscitation, and experiences with and perceptions of counselling and consent for DR studies. An overview of participant characteristics can be found in table 2.

With permission of participants, all interviews were audio-recorded and manually transcribed verbatim. Field notes and transcripts were deidentified. Data were firstly reviewed in a process of open coding, subsequently, data were thematically analysed. During consensus meetings, main themes emerged. Using an iterative approach, these

Table 1. Participant characteristics providers

Code	Profession	Sex	Age (years)	Years at NICU (years)	Center
HCP01	Consultant neonatologist	Male	49	14	LUMC
HCP02	Nurse/Researcher	Female	48	19	LUMC
HCP03	Consultant neonatologist	Female	37	3.5	LUMC
HCP04	Consultant neonatologist	Male	42	4.5	LUMC
HCP05	Resident	Female	27	0.5	LUMC
HCP06	Fellow	Female	35	1.5	LUMC
HCP07	Nurse/Researcher	Female	29	8	LUMC
HCP08	Physician Assistant	Female	33	11	LUMC
HCP09	Nurse	Female	54	30	LUMC
HCP10	Fellow	Female	31	1.5	LUMC
HCP11	Resident	Male	27	0.5	LUMC
HCP12	Nurse	Female	56	17	LUMC
HCP13	Physician Assistant	Female	56	31	LUMC
HCP14	Consultant neonatologist	Male	43	0.5	LUMC
HCP15	Intern	Female	27	0.5	LUMC
HCP16	Resident/Researcher	Male	30	3	LUMC
HCP17	Nurse	Female	30	5.5	LUMC
HCP18	Nurse	Female	26	2	LUMC
HCP19	Nurse trainee	Female	28	1	LUMC
HCP20	Fellow	Male	41	1	LUMC
HCP21	Consultant neonatologist	Male	43	12	LUMC
HCP22	Consultant neonatologist	Female	54	21	LUMC
HCP23	Consultant neonatologist	Male	49	17	LUMC
HCP24	Physician Assistant	Female	45	16	LUMC
HCP25	Researcher	Female	31	1.5	HUP
HCP26	Fellow	Female	32	1.5	HUP
HCP27	Consultant neonatologist	Female	38	6	HUP
HCP28	Consultant neonatologist	Female	35	4	HUP
HCP29	Physician Assistant	Female	34	9	HUP
HCP30	Nurse Practitioner	Female	33	11	HUP
HCP31	Consultant neonatologist	Female	35	4	HUP
HCP32	Consultant neonatologist	Male	34	4	HUP
HCP33	Respiratory Therapist	Male	44	14	HUP
HCP34	Consultant neonatologist	Male	73	46	HUP
HCP35	Respiratory Therapist	Female	44	16	HUP
HCP36	Fellow	Male	35	1.5	HUP
HCP37	Fellow	Male	32	1.5	HUP
HCP38	Fellow	Female	35	0.5	HUP
HCP39	Fellow	Female	33	0.5	HUP
HCP40	Resource Nurse/Nurse Practitioner	Female	34	12	HUP
HCP41	Resource Nurse	Female	28	5	HUP
HCP42	Registered Nurse	Female	58	15	HUP
HCP43	Registered Nurse/Respiratory Therapist	Female	36	23	HUP
HCP44	Registered Nurse	Female	63	41	HUP
HCP45	Resident	Female	31	0.5	HUP
HCP46	Consultant neonatologist	Male	44	15	HUP
HCP47	Fellow	Female	31	1.5	HUP
HCP48	Consultant neonatologist	Male	48	15	HUP

Table 2. Participant characteristics parents

Demographics interviews with parents ***(n = 13 interviews with 25 parents of 19 infants)***	
Fathers *n* (%)	12 (48)
Bereaved *n parents* (%)	2 (8)
Age median (range)	
Mothers	32 (23-41)
Fathers	34 (24-45)
Present during resuscitation *n* (%)	
Mothers	2 (15)*
Fathers	11 (92)
Mode of delivery *n infants* (%)	
Caesarean section	11 (58)
Vaginal	8 (42)
Parity *n mothers* (%)	
Nulliparous	9 (69)
Multiparous	4 (31)
Information provision about DR studies *n parental dyads (%)*	
Not informed about DR studies	1 (8)
Informed about one study	6 (46)
Informed about two DR studies	5 (38)
Informed using deferred consent approach	1 (8)
Consented *n parental dyads (%)*	
Consented to all DR studies	9 (70)
Consented to one, refused another	3 (23)
Refused all DR studies	0 (0)
Informed, but no time to respond	1 (8)
Resuscitation *n infants* (%)	
CPAP	19 (100)
PPV	15 (79)
Intubation	1 (5)
Cardiac resuscitation	1(5)

main themes were explored more in-depth in consecutive interviews. The qualitative data analysis software program Atlas ti (V7.0 and V.8.4), a software program that helps to sort, structure, describe and retrieve qualitative data(44), was used to analyse data.

THE 'THINKER' EMBEDDED

The present study was conducted while the author of this thesis, in the context of RE referred to as the 'Thinker', was embedded within the medical team of the NICU of the LUMC. During the study period, the position of the 'Thinker' changed a lot: while firstly studying the phenomenon of auditing neonatal resuscitation and consent for

DR studies as a relative outsider, the author became a 'third person' herself, as she approached parents for consent for DR studies and functioned as the coordinator of the audit. This fluid position of the researcher has various benefits, but also has pitfalls.(45) Being part of the medical team facilitated rapport, both with providers and parents, but may also have made participants reluctant to be critical. Furthermore, being a 'third person' enabled various valuable participant observations, but proximity and distance always needed to be balanced in order for observations to make sense. (46) Proximity and distance were for instance balanced by researcher triangulation: data were independently analysed and discussed by the author of this thesis and her supervisor working at the Department of Medical Ethics and Health Law of the LUMC.

RESEARCH AIMS

In the present study, moral experiences of stakeholders of improving neonatal resuscitation will be studied and added to the RE. By going back and forth between normative and empirical data, between information stemming from theory (moral principles and background theories) and from practice (morally relevant facts and moral experiences of third persons), the moral landscape of improving neonatal resuscitation will be explored.

OUTLINE OF THE THESIS

In this thesis, two cases will be addressed. Part One of this thesis focuses on consent for DR studies. **Chapter 1** describes the providers' perspective regarding deferred consent for DR studies. Insight in the providers' perspectives shows that deferred consent for DR studies is acceptable, but that the actual usage of the approach can be improved. **Chapter 2** describes the parental perspective regarding consent for DR studies. Interviews with parents showed that, despite being in an emotional and stressful situation, most parents considered being approached for DR studies as valuable. This was mostly due to appropriate timing and communication, compassion and the researcher not being obtrusive. Parents furthermore expressed the need for some sense of control of what happens to their infant, especially in the case of interventions that they perceive as risky. Using insights from the present study, a new approach to deferred consent is proposed in **Chapter 3**. By approaching deferred consent within a Learning Health System, uniform and evidence-based criteria for deferred consent for DR studies can be established.

Part Two of this thesis focuses on recording and auditing neonatal resuscitation. **Chapter 4** provides an overview of ethical challenges and moral principles of recording and auditing neonatal resuscitation. In this review, it is argued that ethical dilemmas arise as recordings of neonatal resuscitation are used in several domains of health care that all have their specific moral framework with requirements and conditions on issues such as privacy, consent and data storage. **Chapter 5** describes the providers' perspective regarding recording and auditing neonatal resuscitation. Providers consider recording and auditing neonatal resuscitation as highly beneficial for learning and improving resuscitation skills. The experiences of the NICU of the LUMC with auditing neonatal resuscitation are recapitulated in **Chapter 6**. In this perspective, it is argued that auditing neonatal resuscitation can be a valuable tool to identify and address various areas for improvement which also allows other NICUs to implement audits of neonatal resuscitation fitting to their improvement needs. In **Chapter 7** parental experiences with reviewing recordings of the neonatal resuscitation of their infant are reported. Parents consider reviewing these recordings valuable for coping with the trauma of neonatal resuscitation and highly value a copy of the video recording as a keepsake.

In the **General Discussion**, the main findings of the present study are assembled and discussed. Future perspectives are then considered. This thesis concludes with a summary of the present study in English and Dutch.

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