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Exploring the Physician Experience of Death and Non-Death Loss in the Neonatal Intensive Care Unit

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Abstract

Objective

We aimed to understand the physician experience of patient loss in the NICU, including the impact of these events, the coping mechanisms utilized, and the evolution of this experience over the career span.

Study Design:

Neonatal-perinatal medicine fellows and neonatologists were recruited in Massachusetts for semi-structured Zoom interviews. Thematic analysis of the transcripts allowed for identification of representative quotes.

Results

In a cohort of 41 participants, impactful losses involved emotional connection, weight of responsibility, and/or unexpected challenges. Most participants described maintaining or increasing optimism about patient outcomes over time. The majority reported that responsibilities related to patient loss improve professional fulfillment but also pose challenges to wellbeing. Peer support was nearly universally mentioned as a coping mechanism. Barriers to coping included other work responsibilities and an unsupportive environment.

Conclusion

These results provide valuable insight into the neonatologist experience of patient loss and suggest avenues for future intervention minded research.

Introduction

The annual infant mortality rate is 5.4 infant deaths per 1 000 live births in the United States. Most of these deaths occur in the neonatal period (less than 28 days of life)[1] and in the hospital[2]. Infants with the highest mortality risk, those with prematurity and congenital malformations[1], are commonly cared for in the Neonatal Intensive Care Unit (NICU). Consequently, among pediatricians, neonatologists bear witness to a significant proportion of infant deaths. Studies have shown that healthcare workers from various specialties experience strong and enduring emotions in response to patient death[3–7], yet the impact of exposure to infant loss on neonatologists has not specifically been explored in depth.

Neonatologists also care for infants with serious morbidities (non-death loss, NDL). These include congenital anomalies, genetic conditions, and hypoxic-ischemic encephalopathy in term infants, in addition to sequelae of prematurity, such as intraventricular hemorrhage, necrotizing enterocolitis, and

chronic lung disease. These conditions often have long-term implications for neurodevelopment, medical complexity (including technology-dependence), and quality of life. The overall improvement in infant survival over the last decades[2], especially in extremely premature infants[8,9], has not been accompanied by significant decreases in rates of NDL in the NICU[8–10]. While this may, in part, be attributed to the increased survival of younger, sicker neonates, the associated medical concerns remain. There is limited research regarding how neonatologists experience the uncertainty and ethical dilemmas that come with care related to NDLs.

Our objectives were to explore neonatologists' recollections of patient deaths and NDLs to identify the most impactful types of cases. Additionally, we aimed to investigate how losses affect neonatologists professionally and personally, to understand what supports neonatologists utilize to cope with patient loss, and to clarify how the experience of patient loss may evolve throughout a neonatologist's career. This was an exploratory study aiming to generate hypotheses about this complex phenomenon.

Materials/Subjects and Methods:

This qualitative phenomenological study was approved by the Boston Children's Hospital Institutional Review Board (P00049471). Findings are reported in accordance with Consolidated Criteria for Reporting Qualitative Research guidelines[11].

Participants and recruitment

Neonatal-perinatal medicine fellows and attending neonatologists (early-career neonatologists, ECANs, less than or equal to 7 years since fellowship graduation and mid-to-late-career neonatologists, M/LCANs, greater than 7 years since fellowship graduation) practicing in Massachusetts were eligible to participate in this study. The delineation of ECANs and M/LCANs was informed by the American Academy of Pediatrics (AAP), Section on Neonatal-Perinatal Medicines (SONPM) career stage definitions. Approximately 104 neonatologists and 28 fellows were approached via email, and recruitment occurred on a rolling basis until thematic saturation was achieved. Informed consent was obtained at the beginning of each interview (Supplementary Material A).

Data collection

Demographic data was collected from the participants prior to the interview using REDCap (Research Electronic Data Capture)[12,13]. The interview guide (Supplementary Material A) was developed by the study team, informed by the available literature and objectives, and piloted on two non-study participants and revised. HZE, a neonatal-perinatal medicine fellow, conducted all interviews, receiving training from co-authors RDG and ELS who are well-versed in conducting qualitative research, as well as via a 10-hour course on qualitative research through Harvard Catalyst. One-on-one semi-structured interviews via Zoom videoconferencing lasting 45 to 70 minutes were recorded and transcribed through Zoom, and the

transcripts reviewed for errors, corrected, and deidentified. Field notes were made for each interview, informing the thematic saturation point.

Analysis

Inductive thematic analysis of the data was performed using NVivo software (Lumivero, version 15). Thematic determination was conducted independently by two investigators (HZE, RDG) and subsequently compared and refined. Each theme and sub-theme were agreed upon by these two personnel. Transcripts were coded according to agreed-upon themes, allowing for identification of representative quotes.

Results

Participants and themes

Our cohort contained 41 participants (13 fellows, 14 ECANs, 14 M/LCANs; Table 1). Figure 1 provides a summary of the identified themes. Impactful cases of death and NDL fell under three primary themes: 1. Personal factors: emotional connection to the case, 2. Professional factors: weight of role and responsibility, and 3. Case factors: unexpected turns or challenges. While there were discrepancies in some sub-themes, the primary themes persisted across career stages and in both cases of death and NDL. We also identified themes regarding the impact of cumulative exposure to death and NDL on the following: 1. Professional fulfillment and wellbeing, 2. Moral distress, and 3. Outlook on patient survival and outcomes. While the primary themes, again, were noted across all career stages, some sub-themes showed variation, as described below. Representative quotes from sub-themes can be found in Tables 2 and 3.

Table 1
Demographic Data.

Age, (mean +/- SD)		**41 +/- 9.4 years**
Career Stage, % (n)	*Fellow*	31.7% (13)
	ECAN	34.1% (14)
	M/LCAN	34.1% (14)
Gender, % (n)	*Female*	80.5% (33)
	Male	19.5% (8)
Race/Ethnicity*, % (n)	*White*	73.2% (30)
	Hispanic	12.2% (5)
	Black	2.4% (1)
	Asian	17.1% (7)
NICU Location*, % (n)	*Urban*	100% (41)
	Suburban	12.2% (5)
NICU Level of Care*, % (n)	*Level 1*	7.3% (3)
	Level 2	34.1% (14)
	Level 3	78% (32)
	Level 4	61% (25)
See patients in follow-up clinic, % (n)		39% (16)
Married or in long-term partnership, % (n)		92.6% (38)
Have children, % (n)		70.7% (29)
Religion/faith/spirituality is an important part of life, % (n)		48.7% (20)

*This table summarizes the collected demographic data for the participants (n=41). *These percentages add up to >100% as many participants identified with more than one race/ethnicity or worked in more than one unit and were instructed to "check all that apply."*

Table 2
Themes: Impactful Types of Death and Non-Death Loss (NDL)

	Secondary & tertiary themes		Representative quote: Case(s) of death	Representative quote: Case(s) of NDL
Emotional connection	Relationship with patient/ family	Identification	[Patient]: *"He was a very sweet baby who would smile and laugh with me and was the same age and a really similar temperament to my son."* – P2 (Fellow) [Parents]: *"It's just easy to form relationships with the people who could have easily been your friends in the outside world."* – P27 (ECAN)	*"I had a lot of trouble sleeping. It was my first [delivery room] code since my son was born…"* - P20 (ECAN)
		Family graciousness	*"He touched sand, because they love going to the beach… They gave me a glass container with the sand that he had touched, and I have it at home on my shelf."* – P35 (M/LCAN)	*"They were very warm people who really took effort to bond with the whole care team."* - P36 (ECAN)
	Loss of the dream	Prior losses, IVF	*"[It was] an IVF pregnancy, last egg… It was a devastating neurological injury, so the parents decided to withdraw care. But it was a very difficult decision to do that, because they knew this was… their last chance."* – P13 (Fellow)	
		Twins	*"There is always going to be that huge mark on their soul where their other baby isn't. Every birthday is going to be marked by the other baby who didn't have a birthday. It's such incredible grief, marked with such incredible gratitude and joy."* – P19 (M/LCAN)	*"This family expected two healthy, beautiful girls. The thought in their head that one would be sitting in front of the car and the other would need a wheelchair..., it was not something that they could live with."* – P1 (M/LCAN)
		Loss of normalcy		*"They [spent] months primarily interacting with the NICU staff and not*

				experiencing the joy[ful] part of being a baby… I think about how that [was] taken from them and their parents.” – P25 (Fellow)
Weight of role & responsibility	Firsts/early	Early authority	*“It was like the first code that I had led as an attending, feeling like I was the last line.”* – P23 (ECAN)	*“I should have picked up the phone, called the attending [surgeon, and [said] ‘you need to come in right now...’ I was uncomfortable doing that.”* – P21 (M/LCAN)
	Retrospective doubt	Questioning something wrong/ missed	*“Is this my fault? Is there something I could have done to prevent this?”* – P29 (Fellow)	*“Is there something we could have done differently? This was not a child who just came to us unable to survive. They had a devastating complication, and that becomes very hard.”* – P38 (ECAN)
		Surprising survival/ outcomes		*“What strikes me is the number of times I see the family show the positives and reference their memory of the negative prognostication.”* – P15 (ECAN)
	Ethical challenges		*“That was so against my best judgment, principles, beliefs… I cannot stop thinking that I basically killed a baby…”* – P11 (M/LCAN)	*“This was a tragedy that nobody benefitted from… Why couldn’t we just say no?”* - P9 (ECAN)
Unexpected turns or challenges	Sudden events	Codes	*“It was like compressing a sponge. Blood [was] coming out and getting on me… That visceral, graphic image... It's like a pit in my stomach of this very sensory experience, feeling*	

		overwhelmed and not knowing what to do...” – P16 (Fellow)	
	No relationship to rely on	*“Whenever we have a busy unit, the patients that are doing okay are the ones that get less of your time and bandwidth. So I can't say that I was particularly close with this family… That's a thing that I feel guilty about sometimes.”* – P17 (Fellow)	
	Lack of closure	*“I didn't have a satisfying sense of what was going on… If I had known…, I wouldn't have felt so bewildered by his decompensation… But his parents didn’t want an autopsy, and the medical examiner didn't ask for an autopsy. So I never had full closure on that.”* – P22 (ECAN)	*“I always wonder how that baby did and if I could have done anything differently… This is a situation where the long-term outcome is unclear.”* – P34 (ECAN)
Full-term		*“Full term babies are so resilient in so many ways… We don't anticipate deaths in those situations.”* – P33 (M/LCAN)	*“[Hypoxic ischemic encephalopathy] cases… touch me the most because of that expectation. It should be a healthy baby.”* – P8 (Fellow)
Unanticipated complications		*“A 29-week infant, who had been on CPAP and had almost gotten to full feeds… One episode of abdominal distension and then [she] passed away 24 hours later.”* – P12 (ECAN)	*“At that single moment, the outcome was defined. You feel so close to this light at the end of the tunnel, and then to have the rug pulled out from under you is really hard.”* – P36 (ECAN)

This table provides representative quotes for each ultimate subtheme regarding impactful cases of death and NDL. The majority of these subthemes were associated with both death and NDL, so there is an example for both. Grayed-out boxes indicated themes that were absent for either death or NDL and therefore have no representative quotes.

Table 3
Themes: Cumulative Impact of Loss

Professional fulfillment & wellbeing	Positive impacts	Gratitude, perspective	*"I've reckoned with all aspects of humanity and the way that that life can go and present itself… not just going through life assuming that everyone will be healthy. It gives me more gratitude in my life outside of medicine as well."* – P6 (Fellow)
		Purpose, meaning	*"That opportunity to …provide to families some sense of peace at a time when everything's falling apart around them… I find that very meaningful."* – P14 (ECAN)
		Knowledge, skill	*"All the patients that I've lost have taught me, not only things about medicine, but also about how to navigate relationships with families, how to communicate about loss."* – P13 (Fellow)
	Negative impacts	Guilt, responsibility	*"There's an overwhelming sense of guilt… I could have done something that would have changed that for the family."* – P26 (M/LCAN)
		Anxiety: workplace	*"There have been sleepless nights where I've been anxious… Did the decision I made impact someone in a certain way? … And neurotically checking orders to make sure mistakes don't happen."* – P39 (Fellow)
		Anxiety: personal (pregnancy/family planning)	*"While I was pregnant and thinking about planning my family, the negative outcome was in my head. Everything can go well until the last minute, and then I could lose the baby."* – P1 (M/LCAN)
Moral distress	Drivers	Conflict	*"We go into this work to help patients and their families. When you feel like you're giving your all, but the family is not receptive of that, and, in fact, angry about it, that can feel really hard... Especially when you know you're taking away time from other patients to focus on, not just the medical care, but the relationship with the family."* – P12 (ECAN)
		Constraint	*"Especially when families go way past where they should… I find that we have no power, even though we know this is not in the best interest of the baby, because the baby is suffering. We're powerless..."* – P4 (M/LCAN)
		Prognostic uncertainty	*"It's just so impossible to describe in a conversation what a severely impacted or medically complex patient is going to look like to the family."* – P17 (Fellow)
	Leadership challenges		*"So much of the role of the physicians on the team is managing the emotions of the team… learning to navigate that with all of the team*

			members who have very different feelings about what's being done.” – P41 (Fellow)
	Evolving viewpoints	Acceptance of different values	*“These parents love and value their children and think they have a great quality of life, even if it's not something that I would necessarily want for my own child.”* – P5 (Fellow)
		Futility	*“Even in the moments of extreme futility, and I don't deny that there are moments when we are doing things that we know are futile… They're actually not futile. They're futile medically, but they're not futile for the family.”* – P20 (ECAN)
Outlook on survival & outcomes	Optimism	Prognostic uncertainty & hope	*“Uncertainty exists in all areas [of medicine], mostly in a negative way, but in the NICU, it can be really positive. Kids surprise us all the time… I feel like that helps me cope.”* – P25 (Fellow)
		More wins than losses	*“It just feels like babies are made of magic stuff sometimes.”* – P16 (Fellow)
		Perspective shifts re: “good” outcomes	*“They have cerebral palsy, but they're smiling; they're laughing; they're playing.”* – P22 (ECAN)
	Pessimism	Since parenthood	*“I think that actually changed [once] I had a child, because I don't think I used to put enough weight on what it's like to care for a child with special needs.”* – P8 (Fellow)
		With experience	*“I more easily jump to very grim... I think it's definitely skewed by the fact that I've seen really sick kids.”* – P7 (Fellow)
		About periviability	*“The pendulum has swung from 24 weeks down to 22 since I've been practicing, and I would say [I’m] pessimistic in that sense… One center might be excellent at this..., [but] I'm not optimistic that we’re [going to] have those outcomes.”* – P30 (M/LCAN)

This table provides representative quotes for each ultimate theme related to the cumulative impact of loss.

Themes: impactful cases of death and NDL

1. Personal factors: emotional connection to the case

All groups recalled cases with a close connection to the patient and/or family. Among fellows and ECANs, especially those with children, this was more often due to identification with a patient who was

somehow like their own baby in personality, age, or appearance, or a patient's parents who were similar in age or life stage, especially those also in medicine. Participants reported living "parallel lives" (P26) to parents and "going through a shared, but very different, experience" (P36). For M/LCANs, this was more commonly due to graciousness despite hardship, families who "taught [them] something about the grace of death" (P19). Identification was more often associated with death, but graciousness was identified in cases of both death and NDL.

Participants also reported empathy in cases that illustrated "loss of the dream" (P1). Examples included "rainbow babies that don't make it" (P31) – deaths that occurred in families that had prior fetal/neonatal loss or difficulty conceiving, twin cases marked by contrasting "sickness and health" (P16), and the loss of normalcy that occurs when NDL causes pregnancy, infancy, and/or childhood to look different than anticipated, resulting in parents "mourning the child they thought they were going to have" (P9).

2. Professional factors: weight of role and responsibility

In this theme, participants grappled with their role and sense of responsibility in the loss. First and early experiences with death seemed to "mark something" (P20) for all groups, even M/LCANs. ECANs commonly recalled their first difficult death as an attending physician, commenting on the striking responsibility that comes with being the "last line" (P23) for the first time. This theme also included deaths and NDLs where the participant questioned if something was missed or could have been done differently – "those [cases] haunt you forever" (P4). Additionally, it encompassed when the patient unexpectedly survived or did well in the face of a significant NDL, and the participant was left doubting the counseling or care that was provided: "they could have redirected care… that weighs on me" (P10). Ethical challenges also often fell under this theme – cases of both death and NDL where the participant "felt responsible for the decisions [their colleagues] didn't agree with" (P38) or provided care that misaligned with their own moral values, often making them feel as though they were violating their "Hippocratic oath of 'do no harm'" (P37).

3. Case factors: unexpected turns or challenges

This final theme encompassed losses that were sudden or unanticipated, such as resuscitation events leading to death or poor outcomes. These losses were particularly difficult when the participant had a nonexistent or limited prior relationship with the family and "only met [them] when everything was falling apart" (P13). These cases of both death and NDL were also reported as challenging when there was a lack of closure, because they "never really understood" what happened (P40), there was loss of follow-up due to patient transfer, or because autopsy was not performed or was inconclusive. Unexpected deaths and NDLs in full-term infants were described as shocking and sad. Deaths and NDLs where patients developed a complication after improving or meeting "milestones" (P15) were especially hard for participants if they had previously delivered reassurance to the family. Experiencing these unanticipated complications often resulted in participant guilt and increased caution with future counseling.

Themes: the cumulative impact of exposure to death and NDL

Professional fulfillment & wellbeing

While challenges to wellbeing including guilt, responsibility, and both workplace and personal anxiety, particularly during periods of pregnancy and family planning, were cited across all career groups, our cohort overwhelmingly reported that caring for patients and families through periods of loss affirms their professional fulfillment and wellbeing. The reasons for this positive impact were: 1. Increased “gratitude and appreciation for life” (P24), 2. A sense of purpose by due to the gravity and meaning of their work – “what I do is life or death” (P8), and 3. Increased knowledge and skill that make them a “better doctor” (P32). When negative impacts were reported, they were almost always described alongside positive ones.

Moral distress

Participants frequently raised both personal experience with moral distress and observing it in team members. There were multiple drivers of distress, including conflicts (between participant and colleague(s), participant and family members, and patients’ family members), constraints (e.g. opposing family wishes/values or limitations in knowledge, resources, time, or skill), and prognostic uncertainty. They not only contended with their own moral distress but discussed the challenges of team leadership during distressing cases. Participants across all groups reported feeling less distress over time due to perspective shifts occurring with greater experience in their role, including becoming more accepting of values that differ from their own – “others may not see that as a good quality of life for anyone, but I’m more open to that than I used to be” (P12) and increased flexibility about medical futility: “Parents need time to get there, so we can keep doing things; we don’t need an answer right now” (P5).

Outlook: patient survival and outcomes

When asked about their outlook on patient survival and outcomes, about half of participants reported steady or increased optimism over time. These participants cited viewing prognostic uncertainty as a vehicle for hope, experiencing “more wins from the verge of death than tragic losses” (P27), and perspective shifts about what they see as a “good” outcome as the reasons for their optimism. About a quarter of the cohort, composed of ECANs and M/LCANs, described being neither more optimistic nor pessimistic, but realistic. They have become “more humble about our ability to predict” outcomes, because “babies surprise us, in both directions” (P1). The remaining quarter of the cohort reported some degree of pessimism, and when we assessed this by career stage, it had a bimodal distribution, being most common in fellows and M/LCANs. The most common reasons for pessimism were increased negative outlook due to realizing “how hard being a parent [to a healthy child] is” (P33), experiencing more bad outcomes – “thinking back on all of [their] patients who did really poorly” (P29), and the

changing definition of periviability. Of note, the majority of the M/LCANs who reported increased pessimism specifically noted that this was at least in part because of infants born at 22–23 weeks' gestation, saying "we don't have enough exposure" (P24) and "are still trying to figure out how to manage that population" (P35). Fellows and ECANs did not report pessimism about periviability.

Coping and barriers to coping

Participants identified helpful coping mechanisms and barriers to coping when experiencing a patient loss (Fig. 2). Discussing the case with others was nearly universally identified, and most preferred to speak with colleagues. About half of participants reported talking about cases with their partner. Those with non-medical partners said this allows them to step away from the medicine and receive emotional support. A few also mentioned speaking with a therapist. The next most identified strategy was separation from work, such as a break/vacation, compartmentalization, or spending time with family. Some specifically make a point to not bring their work home, because they want to "protect" their spouse or other family members. Self-care strategies (e.g. sleep/rest, exercise, walking, meditation, or creative outlets) were identified by about half of participants. Some noted that learning about the case was helpful, including reading literature privately or attending a medical debrief or morbidity and mortality (M&M) conference. Emotional presence by connecting with the family at bedside, writing a card, or attending the memorial service was noted by several of participants. Finally, while nearly half of the participants cited that faith, religion, or spirituality was an important part of their life, only a few mentioned it as a coping mechanism for dealing with patient loss.

Not all participants identified a barrier to coping, but the most identified barrier was work-related responsibilities and exhaustion. An unsupportive work environment was cited by about a third of participants, including debriefing and M&M practices described as "more distressing than the event itself… like a blame game" (P2), "extremely isolating" (P4), "punitive" (P7), "onerous" (P16), "critical" (P29), or "accusatory" (P39). Self-questioning was described as a barrier by some participants, and legal action (or fear thereof) was mentioned by a few participants, as well.

Discussion

This study describes the impact of patient death and NDL on neonatologists, emphasizing that cases which involve personal connection, responsibility, or unexpectedness can lead to both acute and lasting powerful emotions. Negative feelings, including self-doubt, guilt, and anxiety, may interact with personal factors, such as life stage, pessimism, and difficulty with prognostic uncertainty, as well as professional factors, including negative workplace environment. Our results additionally highlight the fulfilling nature of a career in neonatology, fulfillment that may be sustained by meaningful patient-family relationships, optimism, hope, and a supportive workplace culture. Most of our themes persisted across career stages, but we interestingly observed a bimodal distribution of pessimism about patient survival and outcomes.

We observed many themes that emphasize the rewarding potential of neonatologists' work. Responsibilities associated with patient loss have the power to provide neonatologists with gratitude,

purpose, and critical skills and knowledge, which likely bolster their sense of accomplishment and could even play a role in preventing burnout. We also demonstrated perspective shifts that occur with experience and help neonatologists cope with and understand morally distressing cases, including evolving viewpoints on differing values, futility, “good” versus “bad” outcomes, and prognostic uncertainty. These viewpoints may allow for maintenance and/or expansion of hopeful and optimistic outlook. The importance of connecting prognostic uncertainty and hope has been demonstrated for NICU parents in several studies[14–16], but to this point, it has only been theoretically discussed for physicians[17], so it is promising to see this emerge as a theme in the current study. We also know that NICU parents value and prefer optimistic framing of prognostication[16], so adopting this mentality may strengthen neonatologists’ relationships with patients’ families, further contributing to their sense of professional fulfillment.

In considering the negative implications of our findings, we noted that several identified themes tie into the domains of burnout – emotional exhaustion, depersonalization, and diminishing personal accomplishment[18]. Burnout symptoms have been reported in up to one-third of neonatologists and have implications for physician wellbeing, professional fulfillment, and retention in medicine, as well as for the quality and safety of patient care[19,20]. Our participants identified administrative tasks that have been associated with emotional exhaustion (e.g. documentation)[21] as barriers to coping with patient loss. Moral distress has been closely associated with emotional exhaustion[22], and we found that neonatologists not only experience moral distress themselves but are challenged by navigating leadership in these situations. Depersonalization appeared in the theme of unexpected losses that lacked patient-family relationships. It’s also possible that exposure to identification may lead to depersonalization as a self-protective measure, as we observed this being associated with personal anxiety in periods of family planning and pregnancy. Finally, we saw that neonatologists experience threats to their sense of accomplishment though workplace events that result in self-doubt or guilt, especially when they occur in an unsupportive environment.

A bimodal distribution of pessimism in terms of career stage has not been previously described, but prior studies have shown that neonatologists tend to be more pessimistic than parents[23], overestimating both morbidity and mortality[24]. Additionally, they have associated pessimism with burnout[25] and prognostic uncertainty with both burnout and moral distress[26,27]. Trainees are at higher risk for burnout[28] and moral distress[29], which may, in part, explain the increased prevalence of pessimism in our fellow group. The reason behind increased pessimism in M/LCANs is less obvious and warrants further investigation, but they may have unique perspectives on the evolving limits of viability, interventions for children with genetic disorders and congenital malformations, and generational shifts in neonatology toward family-centered care.

Limitations

While the participants for this study were recruited from across Massachusetts, the majority practiced at a Harvard Medical School-affiliated hospital in Boston, which overall limits the patient population to which they were exposed. Though many participants worked in level one or two units, none exclusively worked in these environments. Furthermore, because of the small and well-resourced nature of Massachusetts, we had no representation from rural environments and even those participants working in level one or two units were proximal to higher-acuity centers with access to support and transport. This may have impacted our ability to capture stories from resource-limited settings. Only actively practicing neonatologists were recruited, so we didn't hear about the experience of anyone who left neonatology or medicine all together. Finally, many of the participants knew the interviewer personally, and this may have changed the formality of their responses.

Future directions & Conclusions

The results of this study suggest that despite their stressful nature, professional responsibilities surrounding loss can enhance professional fulfillment. To ensure neonatologists are confident and comfortable performing these responsibilities, it is important to invest in quality medical education focused on end-of-life care, complex counseling, and leadership during ethical dilemmas and code events. Furthermore, optimism and positive outlook are not only valued by NICU families[16] but may be protective for neonatologists, so these educational interventions should be framed with that perspective in mind. It is unsurprising that peer support surrounding challenging cases is one of the best tools we have to facilitate resilient coping[30–36], however, the way we talk about these cases matters. Unsupportive culture, both informally through "gossip"[37] and formally during M&Ms and debriefs, has implications for physician mental health (PTSD, depression, and suicide) and retention in medicine[37–41]. Future studies should focus on frameworks for implementing debriefs and M&Ms in a psychologically safe way.

Neonatologists are deeply impacted by infant death and NDL, especially by cases that are emotionally poignant, weighted by a sense responsibility, and/or unexpected. These experiences have long-term implications for professional fulfillment, perspectives on moral distress, and outlook on patient survival and outcomes. The stressful nature of a career in neonatology poses risks to both the mental health and wellbeing of neonatologists and the care their patients receive, yet the responsibilities of this work have the potential to be extremely rewarding. Future studies should explore medical education and support interventions that focus on harnessing that potential.

Abbreviations

ECAN – Early-career neonatologist, in accordance with the AAP SONPM definition, practicing ≤ 7 years since fellowship graduation

M/LCAN – Mid-to-late-career neonatologists, practicing >7 years since fellowship graduation

NICU – Neonatal intensive care unit

NDL – Non-death loss (serious morbidities that may impact quality of life)

M&M – Morbidity and mortality [conference]

Declarations

Conflicts of Interest

The authors have no relevant conflicts of interest to disclose.

Ethics approval and consent to participate

This study was approved by the Boston Children's Hospital Institutional Review Board (P00049471), and the study was performed in accordance with the Declaration of Helsinki. Consent was obtained at the beginning of each interview (Supplementary Material A).

Availability of Data and Materials

The authors are happy to provide de-identified transcripts at the request of the reviewers or editors. To protect our participant and their patients, transcripts will not be made publicly available. While identifying information of patients and participants was removed from the transcripts, the specific and detailed nature of the disclosed stories makes it impossible to ensure complete confidentiality, and thus we believe these should not be widely distributed.

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Author Contributions

H Evans conceptualized the study, developed and revised the semi-structured interview template, performed and reviewed the pilot interviews, recruited and interviewed all participants, cleaned and deidentified interview transcripts, developed the thematic framework, coded and analyzed the transcripts, drafted the manuscript, and revised the manuscript. E Sabbath developed and revised the semi-structured interview template, reviewed the pilot interviews, and reviewed and revised the manuscript. R Goldstein conceptualized the study, performed and reviewed the pilot interviews, developed and revised the semi-structured interview template, developed the thematic framework, coded the transcripts, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Figures

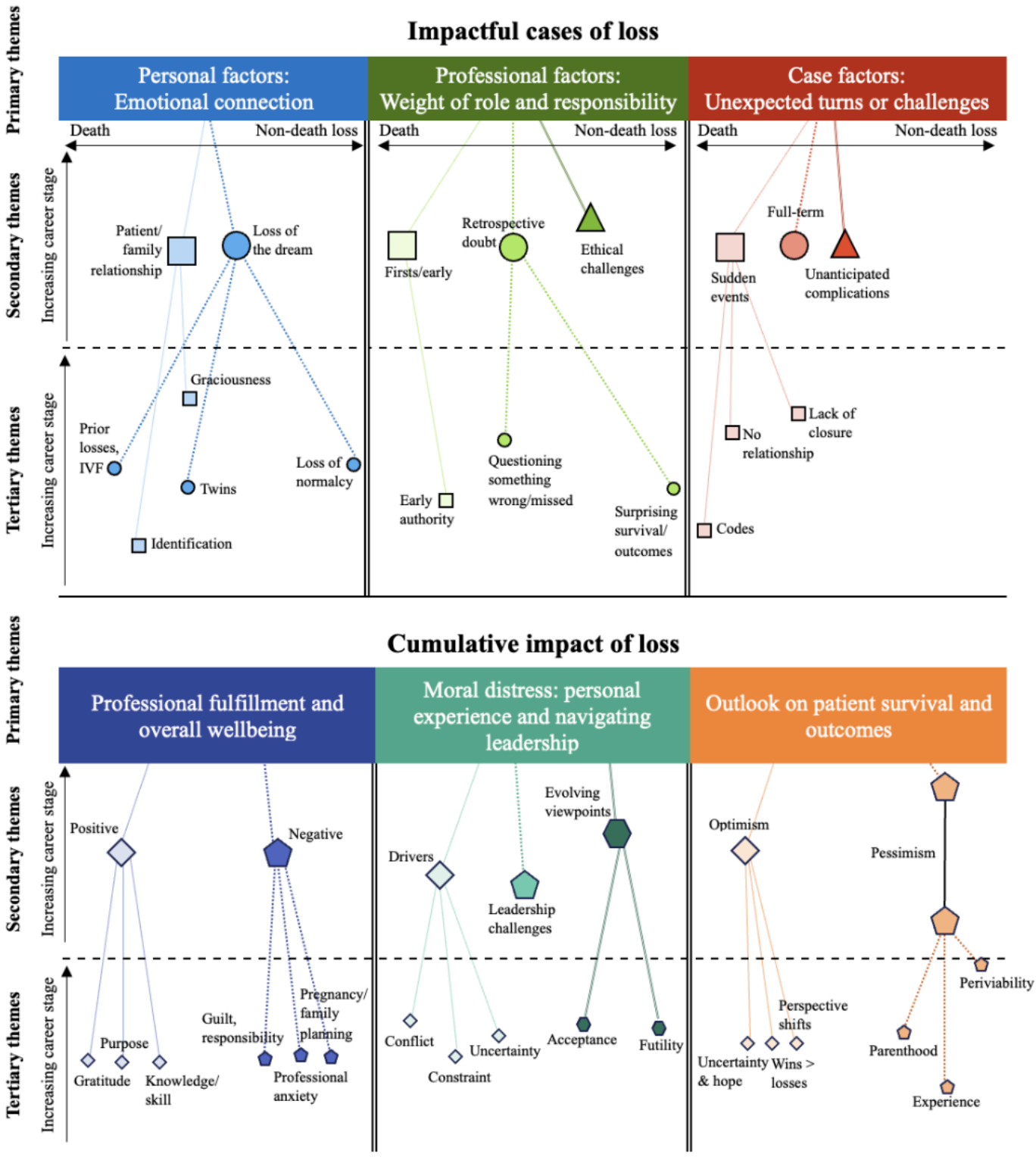


Figure 1

Summary of Themes. *The top half of this figure depicts the themes of impactful cases of both death and non-death loss (NDL). The primary themes of impactful loss are noted at the top of the figure and secondary and tertiary themes are noted below. Each sub-theme's placement on the x-axis is intentionally more to the left within its box if it was more commonly associated with death and to the right if it was more commonly associated with NDL. Additionally, the shapes are placed on the y-axis more superiorly within*

their box as they were associated with more experienced career stage. The bottom half of the figure summarizes the cumulative impact of experiencing these cases of loss with the same format. Of note, these themes were not specific to certain cases of death or NDL, so there is no meaning to the placement of these themes on the x-axis. The y-axis of career stage persists within these themes, but most were identified equally or nearly equally across career groups, except for pessimism, which was bimodally distributed as noted by the double pentagon shape.

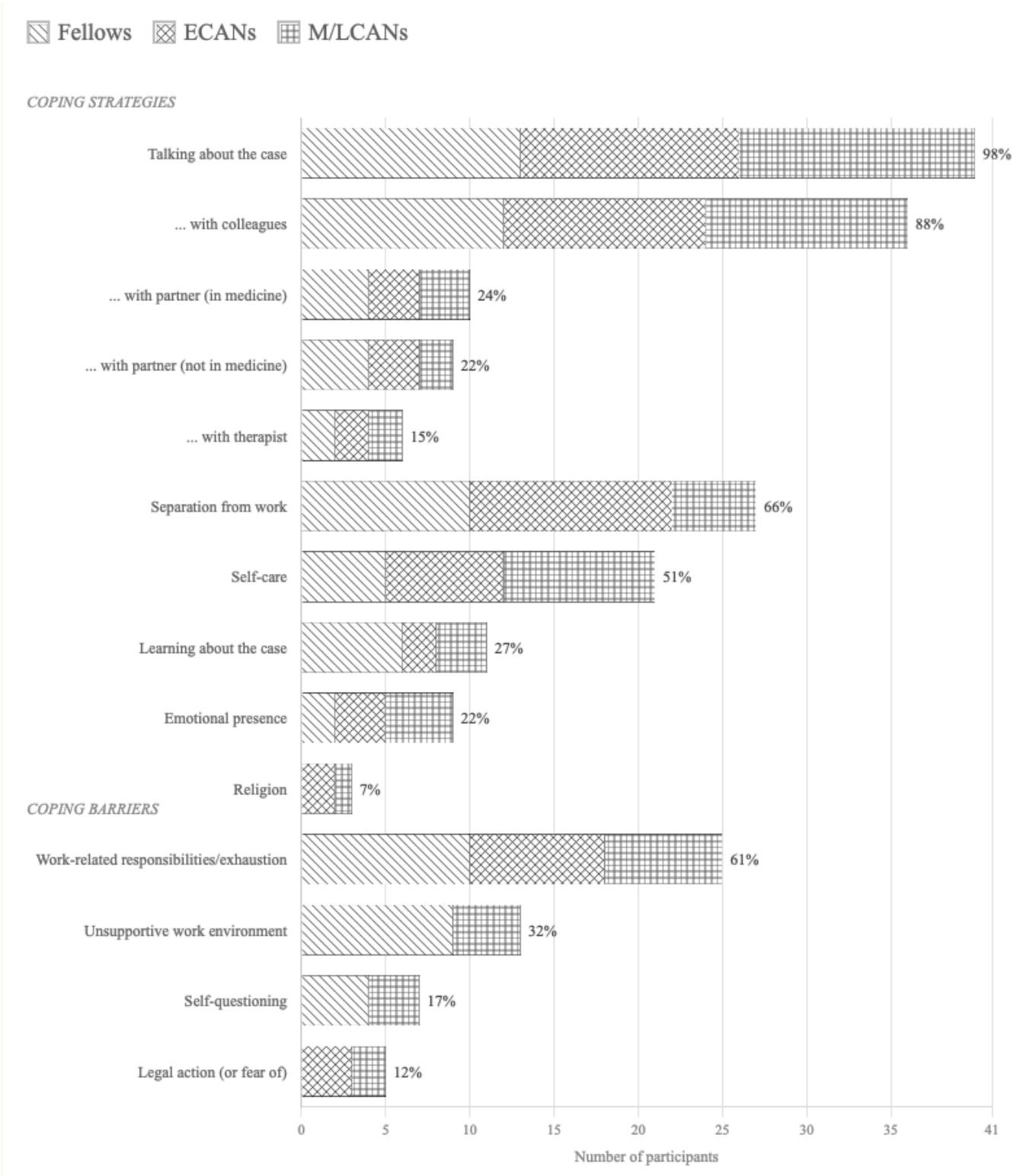


Figure 2

Coping Strategies and Barriers. This figure represents the number of participants that identified each of the above coping strategies and barriers to coping. The bars are cross-hatched as noted in the figure legend to represent the number of fellows, ECANs, and M/LCANs, respectively. The percentages at the end of each bar represent the total percent of participants that identified each strategy or barrier.