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ARTICLE

Global health training during neonatal fellowship: fellow and program director perspectives

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Abstract

Objective This study explored the availability and perception of Global Health (GH) training opportunities in US-based Neonatal–Perinatal Medicine (NPM) fellowship programs.

Study design Electronic surveys, containing discrete choice and open-ended questions, were distributed to current and recent fellows and to Program Directors (PDs).

Results Fifty-eight PDs and ninety-eight fellows completed the survey. Fellows reported declining GH participation from 48% in medical school to 21% in fellowship. Among the 42% of fellows reporting GH opportunities at their programs, 30% personally participated. Fewer than 30% of these programs offer structured classroom or online learning; 10% offer research opportunities. 72% of fellows stated that GH availability is moderately to extremely important, compared with 58% of PDs. PDs cited cost, scheduling, mentorship, and lack of suitable global partners as barriers to supporting fellows in GH.

Conclusion NPM fellows place high importance on GH opportunities during fellowship, but only a minority engage in GH work.

Introduction

Over the past three decades, a significant reduction in under-five mortality has occurred globally, in alignment with the World Health Organization Millennium Development Goals. While overall early childhood mortality decreased from 93 per 1000 live births in 1990 to 41 per 1000 live births in 2016, the proportion of these deaths occurring during the neonatal period rose steadily [1]. As of 2017, 2.5 million infants died in the first month of life, and neonatal deaths comprised 46% of deaths in children under 5 years old [2], with prematurity alone identified by the WHO as a leading cause of death in children under five. Furthermore, the vast majority of these neonatal deaths occurred in low- and middle-income countries [3], and an estimated two-thirds of the world's newborn deaths were directly related to lack of quality care in the perinatal period [4].

The awareness of this need to address broader pediatric health inequalities over the past several decades has led to an increased interest in global health (GH) involvement by academic institutions around the United States (US), with a corresponding rise in available GH programing for medical trainees [5–11]. International electives are popular among US medical students, with 26% of those graduating in 2018 reporting participation in at least one GH experience during medical school [12]. Similarly, a 2016 review noted that 73% of pediatric residents reported that GH training was available through their program and 13.5% completed an international elective during residency [13]. In addition, 24% of pediatric residency programs identified having a GH track [14], and, as of 2012, there were ten dedicated pediatric GH fellowship programs nationwide [15]. While global opportunities for pediatric residents continue to rise, to our knowledge no prior work has explored if this trend is mirrored for fellows pursuing pediatric subspecialty training.

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Neonatal–Perinatal Medicine (NPM) is currently the largest subspecialty field for pediatric trainees. The number of fellows entering NPM fellowship has grown by 11% from 2013 to 2018, and now represents 15% of the annual graduating class of pediatricians [16, 17]. With newborn health contributing disproportionately to early childhood mortality rates, ongoing engagement in GH for individuals interested in NPM is paramount to addressing this global need. Our group hypothesized that GH engagement by NPM fellows would be lower than that seen in pediatric residents, and we aimed to determine the availability of GH opportunities in NPM fellowship programs. Secondarily, we explored the discrepancy between desire to engage and true rates of engagement, focusing on the prevailing attitudes towards GH training during fellowship from NPM fellows and program directors (PDs).

Subjects and methods

A structured survey was developed following review of the American Board of Pediatrics' (ABP) recommendations for GH programing, as well as literature pertaining to GH training across specialties. Electronic surveys were distributed to current NPM fellows and those within 7 years of training via the Training and Early Career Neonatologists (TECaN) group within the American Academy of Pediatrics' (AAP) Section on Neonatal Perinatal Medicine (SoNPM), as well as to fellowship PDs via the Organization of Neonatal–Perinatal Medicine Training Program Directors (ONTPD). Surveys consisted of discrete choice and open-ended response questions addressing the prevalence of GH opportunities, fellow engagement in GH, the structure of existing GH training, and the perceived value of such training by fellows and PDs. Open-ended questions addressed perceived benefits of and barriers to GH involvement during fellowship for NPM trainees and for fellowship programs. Demographic data were collected, as was the degree of faculty engagement in GH in each participating NPM division. The survey instrument (supplement 1) was piloted for ease of use by 12 users from TECaN's executive council and underwent minor revisions in content and flow prior to distribution.

Discrete choice survey responses were analyzed in Microsoft Excel and using InStat V 3.0. Free-response questions underwent thematic analysis by the primary author with secondary review by the additional authors. Finally, NPM fellowship websites were evaluated to ascertain the percentage of NPM fellowship programs that advertise GH opportunities available during fellowship, faculty participation in GH research, and the presence of an institutional GH center.

Table 1 Demographics of survey respondents. Characteristics of current and recent NPM fellows and fellowship PDs that participated in the surveys.

Demographics of survey respondents		
	Current and recent NPM fellows	Program directors
Total survey responses	98	58
Gender—total responses	84	46
Male	15 (18%)	16 (35%)
Female	69 (82%)	30 (65%)
Age category (mode)	30–33	40–49
Years in practice—TECaN, total responses	83	
Current fellow	57 (69%)	
0–2	18 (22%)	
3–7	8 (10%)	
Years in practice—PDs, total responses		28
<5		1 (4%)
5–10		18 (64%)
11–21		2 (7%)
21–30		1 (4%)
>30		6 (21%)
Birth location—total responses	82	50
USA	68 (83%)	36 (72%)
Other	14 (17%)	14 (28%)
Medical school location—total responses	83	50
USA	72 (87%)	40 (80%)
Other	11 (13%)	10 (20%)
AAP district—total responses	83	50
I	6 (7%)	8 (16%)
II	5 (6%)	7 (14%)
III	11 (13%)	7 (14%)
IV	9 (11%)	4 (8%)
V	11 (13%)	3 (6%)
VI	12 (14%)	12 (24%)
VII	7 (8%)	2 (4)
VIII	10 (12%)	3 (6%)
IX	9 (11%)	3 (6%)
X	3 (4%)	1 (2%)

Results

Fifty-eight of 100 PDs (response rate 58%) completed the survey (Table 1). Within this group, 53% stated that GH opportunities for NPM fellows are available through their program. When describing GH within their institutions, 81% cited options for pediatric residents and 97% noted opportunities for medical students. According to PDs, 62%

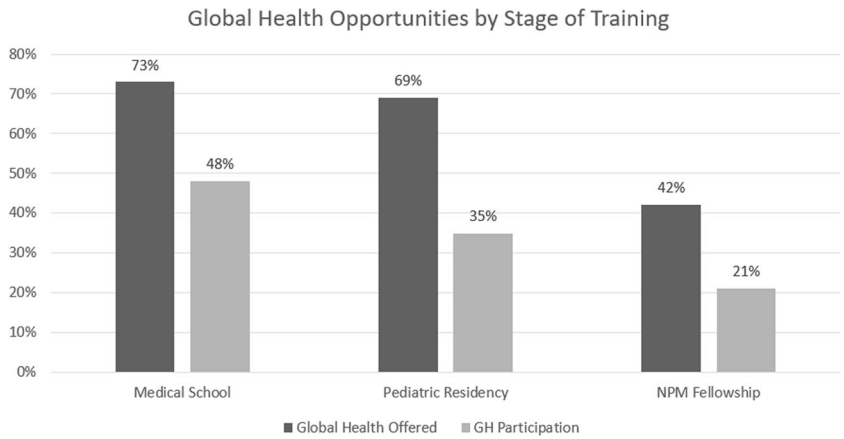

Fig. 1 Global health opportunities by stage of training. Results based on a survey of current and recent neonatology fellows, with "participation" consisting of an on-the-ground clinical or research experience conducted during NPM fellowship.

of NPM programs have had at least one fellow participate in GH in the past 5 years. Of programs with GH opportunities, 52% have had <10% of their fellows participate, 42% claimed 10–25% partaking in GH activities, and 6% have had >25% of fellows engaged in GH work.

A total of 98 TECaN members completed the survey. Exact response rate could not be calculated, as the number of active and non-duplicate email addresses on the TECaN listserv is unknown. Though not a representative sample, surveys were completed by demographically diverse respondents from the target population of NPM fellows and early career neonatologists (ECaNs), representing geographically diverse regions. Sixty-eight percent of respondents were current fellows, 22% ECaNs within 2 years of fellowship, and 10% were neonatologists between 3 and 7 years out from training (Table 1). Amongst TECaN respondents, 42% stated that GH opportunities were currently available at their institution for NPM fellows. Similar to NPM PDs, TECaN members reported a decline in participation in GH opportunities as stage of training increased. Thirty percent of respondents received some GH education, ranging from lectures at their home institution to participation in international electives. Just 21% reported engaging in clinical or research experiences abroad during fellowship, compared with 35% in residency and 48% in medical school (Fig. 1).

The specific components of fellow GH experiences varied. PDs and fellows cited similar ranges of allotted time for on-the-ground work, with the majority of experiences lasting 1–2 months. Most experiences took place in Africa and occurred in a clinical, inpatient setting. The majority of programs categorized time-spent on GH as "research" in the fellow's schedule. Reported fellow GH experiences by NPM fellowship PDs are summarized in Fig. 2. Both fellows and PDs cited the two primary funding sources for GH experiences as fellow-specific funds, or "educational fund", and institutional grants. Fewer than 30% of NPM fellowship programs that claim to have GH training offer structured classroom learning or an online curriculum, and only 10% offer research opportunities for fellows. Programs that offer domestic, topic-based GH education for fellows focus on epidemiology, ethics, and cultural sensitivity.

When asked about the importance of GH opportunities being available to fellows during their training, 40% of fellows and 30% of PDs stated that GH availability is "very" or "extremely" important. Of the 58 PDs who participated in the survey, 22 (38%) had personal GH experience. These PDs were more likely to be supportive of fellow GH engagement, with 35% stating that GH for fellows was "very" or "extremely" important compared with 20% of PDs without GH experience. (Fig. 3). PDs cited cost, scheduling, and lack of suitable global partners as barriers to supporting fellows in this work. A minority of PDs identified the need for fellows to be present domestically for division lectures and educational activities. Fellows similarly noted cost, time constraints, and mentorship to be challenges to GH participation during fellowship. Both PDs and fellows commented how GH engagement broadens fellow perspective on neonatal care, and that programs offering GH opportunities may attract more competitive fellowship applicants (Table 2). Although safety was cited as a barrier from the broad group of NPM PDs, when the subset that offer GH opportunities was asked directly if safety concerns limit NPM division support for trainee GH engagement, 91% stated that they either "remain supportive of GH experiences for fellows despite restriction on travel to certain countries due to safety concerns" or that "safety concerns do not impact our GH policies". No definition of "safety" was provided when eliciting PD responses, as institutional definitions of "safety" vary and the intent was to delineate safety concerns and their impact on facilitating fellow involvement in GH.

With regards to long-term career plans, 34% of responding TECaN members stated that they were either "very likely" or "have definite plans" to participate in GH work after fellowship. Twenty-six percent stated that they were "somewhat likely" to engage in GH work, and 35%

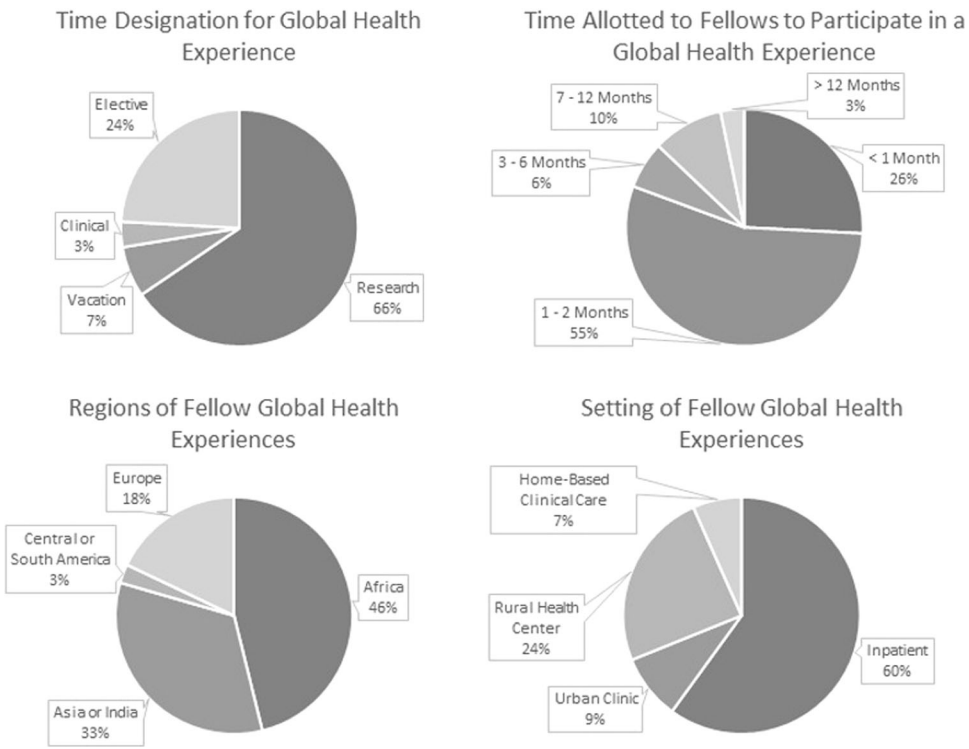

Fig. 2 Summary of global health experiences for NPM fellows. Based on responses from NPM fellowship program directors.

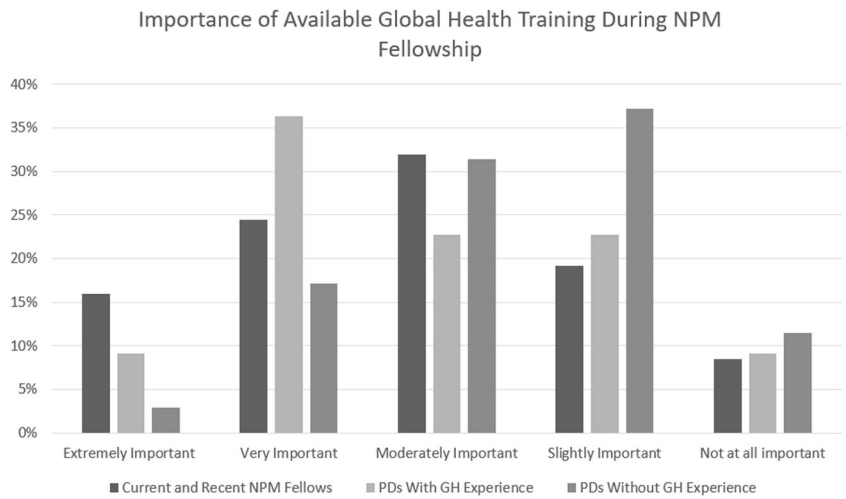

Fig. 3 Perceived importance of global health opportunities by role. TECaN members and NPM program directors were asked identical questions about the value of global health training during fellowship. Program director responses are separated based on the presence or absence of personal global health experience.

were "unlikely" to seek out such experiences. Examining GH expertize within participating NPM divisions, PDs noted that 55% of their programs have a faculty member engaged in GH work, 25% have faculty who have published in GH, and 43% of institutions have an established relationship with a partner in a low or middle-income country.

There are currently 100 NPM fellowships listed on the AAP website. Nineteen advertised GH training opportunities for NPM fellows, 17 advertised NPM faculty participating in GH research, 60 were associated with pediatric residencies offering GH opportunities, and 78 were connected to institutional GH centers.

Discussion

The burden of neonatal mortality on the total under-five mortality rates worldwide necessitates emphasis on facilitating the engagement of newborn specialists and trainees interested in international experiences. However, published guides on house officer engagement specific to pediatrics in GH focus on the residency level trainees [5–11]. Our study is the first to investigate availability of GH opportunities for NPM trainees, as well as to explore NPM fellows', early career neonatologists', and PDs' perceptions of the value and barriers to these experiences. Our findings note

Table 2 Illustrative quotes from NPM fellows and fellowship PDs. Responses describing the benefits, challenges, and limitations in implementing global health opportunities for NPM fellows from the perspective of current and recent fellows, as well as from program directors. Chosen quotes represent the predominant themes identified in the free-responses questions of the survey.

	Perspectives on implementing global health experiences for neonatal–perinatal medicine fellows	
	NPM fellows	NPM program directors
Benefits of GH to NPM fellows	"For those who are interested and plan on pursuing a career in global health, I can imagine it's crucial." "Perspective and understanding of broader context of newborn health issues." "This would open career development and research opportunities not often utilized. There is great benefit to our learning, also to see how neonatology is developing in underserved areas."	"Helps trainees understand healthcare-related global issues." "Widened scope of knowledge and experience."
Benefits of GH to NPM programs	"Partnership with other institutions in other nations and the ability to attract faculty with an interest in global health." "Increasing numbers of applicants seek out this experience—may allow programs to attract higher quality candidates."	"Opportunities for learning, teaching, and collaborating with people from all over the world." "Improved recruitment." "Increased opportunities are good for making a program."
Challenges of GH to NPM fellows	"Time away from clinical duties and family." "Ability to publish scholarly activity." "Finding time to be abroad. If interested from a research perspective, this is even more challenging to accomplish given time constraints, funding." "Finding ways to fit clinical experiences into an already very demanding schedule."	"Having adequate time to also complete all requirements of fellowship." "Safety, funding, and missing portions of core curriculum while abroad." "Time and safety."
Challenges of GH to NPM programs	"Having faculty and resources to support a global health program." "Fellow coverage for the home NICU while missing a fellow to a global health rotation." "Fitting it into required rotations, funding, and equal opportunities for all interested." "Funding, safety, reliability and ability to competently and continually staff a site (i.e., local mentors/staff)"	"1. Fellow safety, 2. Funding, 3. Having an organized program that provides adequate educational experiences." "Call schedule issues, funding, adequate education." "Time and financial barriers."
Limitations to offering GH to NPM fellows	"The perception that it is a new area of research/specialization, with some older faculty seeing it as an excuse to travel." "Lack of funding and supportive faculty." "A program has to either be large enough, or flexible enough, to accommodate fellows being abroad for an extended period of time. Further, there needs to be global health focused faculty available as mentors for those fellows." "Many successful programs require significant time commitment abroad —not everyone is able to do this."	"Funding and mentorship availability." "Funding, availability of appropriate programs and alliances." "Unless there is an established relationship, research is nearly impossible and the fellows may be considered 'fly-in' physicians without a grounded, long-lasting impact on the care and health of the communities they visit."

considerable disparity between trainees' desire to engage in global neonatal care and the limited level of international involvement by NPM trainees during fellowship.

Our study revealed several key observations about GH engagement by NPM fellows. Firstly, while GH opportunities are offered at a majority of programs, there is limited participation by NPM trainees. While 62% of programs cite a current or recent fellow participating in GH, the majority of these same programs note that <10% of their fellows carry out a GH project during training. Secondly, this mismatch seems to stem not from fellow disinterest, as 34% of fellows stated they were "very likely" or had "definite plans" to engage in GH as faculty but only 21% cited involvement in GH during training. Lastly, the perceived value of GH training for NPM fellows differs both between fellows and PDs, and between PDs who have personally been involved in GH projects and those that have not. This study aligns with prior work by demonstrating an inverse association between degree of GH engagement and level of specialty training. Our review of NPM websites reemphasized this finding with 78% of NPM fellowships existing at institutions with a GH center, 60% at institutions with a

pediatric residency advertising GH involvement, but only 19% of NPM fellowships advertising GH training opportunities for trainees.

With 53% of PDs and 42% of NPM fellows stating that GH opportunities are available at their institutions, the challenge of fostering trainee engagement depends less on increasing access to GH and more on integrating GH into the fellowship schedule and curriculum. Despite the reported availability, only 21% of surveyed TECaN members reported personally engaging in GH work during fellowship training. Amongst all fellows surveyed, 35% reported involvement in GH during residency and 48% in medical school. These values are higher than previously reported national rates of 13.5 and 26%, respectively [12, 13]. This may indicate that our identified rate of 21% engagement during fellowship overestimates actual national GH participation during NPM training.

Both fellows and PDs highlighted logistical challenges such as cost, call and service coverage, and mentorship as the primary limitations to increased GH involvement by NPM trainees. Financing alone can be prohibitive of GH opportunities at programs with limited institutional support, with the cost of flights, lodging, visas, immunizations, and other key travel expenses totaling a minimum of several thousand dollars. These barriers are well-known challenges in the field of global medical education [18, 19]. Indeed many subspecialties have noted that the main barriers to participation in GH is not a lack of interest, but rather limited funding support, protected time, and institutional recognition of academic contributions [20]. While guidelines exist for trainees, sponsors, and host sites to help ensure international electives are carried out in an ethically sound manner, ensuring mutual benefit between host and visiting trainee, safety, and appropriate planning and debriefing, there exists little information on how to tackle the larger issues of funding and mentorship [21]. Specifically, this need for quality host-institution mentorship is well understood and spans medical specialities [22]. In NPM fellowship, a fellow participating in a high-quality GH clinical rotation or research project depends on a strong team of mentors, with representation from both home and host institutions.

Beyond considerations of logistics, a successful NPM GH program inherently depends upon division leadership valuing GH work. It is notable that, in our survey, PDs with personal experience in GH were more likely to place higher value on the availability of GH opportunities for fellows. Buy-in at the division level may hinge on seeing how the existence of a GH program can also benefit the US institution. Both PDs and fellows commented how the presence of a GH program for trainees increases recruitment of top applicants, a finding that has been previously described in other specialties [23, 24]. International electives have also been shown to help residents develop competency in the ACGME core domains and improve their professional and personal development [25]. GH training has been linked with improved medical knowledge, cultural competence, cost-conscious care provision, and greater satisfaction with training [26–29].

Engagement in GH also allows academic institutions to enhance their educational and research missions through the use of collaborations [30]. Clinical-based GH education remains the most common type of international involvement across medical specialties, including pediatrics [31], a finding that was reflected in our findings as well. Although in our survey the vast majority of fellows used their allotted research time for their international experience, only 10% acknowledged that they participated in research. This was mirrored by 55% of PDs reporting division faculty engaged in GH, but only 25% with faculty who have published in the field. While what constitutes a "research elective" varies by institution, research is an integral part of NPM fellowship given the ABP requirement to generate a scholarly product prior to graduation. Several US NPM programs with established GH expertize have demonstrated that even short-term (2–4 week) research electives, conducted under the umbrella of a larger GH research infrastructure, can lead to successful scholarly products. This model, however, is not wide-spread amongst NPM programs.

Similarly, the field of quality improvement (QI) is a dynamic area of research that could have positive impact on neonatal mortality [32], and should be considered by programs aiming to adapt traditional educational offerings to a global setting to improve the academic outputs of these international experiences. Just as QI and traditional research have led to advances in the neonatal care practice in the US, a global reduction in neonatal mortality will depend upon multifaceted efforts into improving clinical care, as well as medical, educational, and implementation research [33].

Equipping neonatal subspecialists with skills to be culturally sensitive and capable of contributing to the field of neonatology on a global level has the potential to improve perinatal mortality. With the majority of NPM fellows in our study reporting that they are somewhat likely, very likely, or have definite plans to engage in GH following completion of their NPM training, making opportunities for international engagement accessible to trainees is imperative. At the same time, NPM programs facilitating GH opportunities for trainees must be thoughtful in their offerings, ensuring that clinical and research work abroad is carried out in a mutually beneficial manner with an emphasis on long-term partnership formation, sustainability of initiatives, and reciprocity of educational opportunities.

Currently, a high level of variability exists between US NPM training sites regarding size and degree of GH infrastructure and resources, suggesting that a multi-institution

partnership or the facilitation of GH opportunities through a larger academic body may be warranted to address the gap between fellows' desire for opportunities and availability at their training sites. Connecting interested NPM fellows to mentors within an organization that has preestablished global partnerships may help address concerns regarding "single-visit projects" and promote relationship building amongst global sites. As 43% of PDs in our survey reported that GH opportunities were available more broadly within their institution, leveraging intra-institutional connections may be an appropriate tactic for many NPM fellowship programs. This approach would not, however, alleviate the need for solid divisional or departmental mentorship for fellows interested in GH, as personalized career development and focused research training will likely be needed in parallel with on-the-ground experiences.

Finally, engaging fellows in US-based research on local health disparities and health equity may compliment global experiences by helping to prepare trainees for future work in global low-resource settings, while not being subject to the same time and financial barriers associated with GH travel. As we strive to address global neonatal mortality, fellow interest in GH should be nourished through domestic and international mentorship, and academic institutions must strive to enact better funding and time support mechanisms to facilitate fellow, and faculty, involvement in global projects.

Strengths and limitations

There were several limitations to our survey. Survey-based studies are prone to response bias, and due to the nature of the recruitment via the listserv and anonymity of the survey, we are unable to determine whether our fellow respondents were representative of fellowship graduates in the US. Subscription to the TECaN listerv is voluntary, so many NPM fellows and ECaNs are not on the distribution list; likewise, graduating fellow members of TECaN often change institutions following training, resulting in an inaccurate email addresses in the database. In addition, it is possible that multiple fellows from same institution completed the survey, while other institutions had no respondents, potentially weighting the NPM fellow responses disproportionately. The ONTPD listserv is smaller and more actively maintained, allowing an accurate response rate to be determined. For both fellows and PDs, individuals with an interest in GH may have been more likely to complete our surveys, creating response bias. Suggestion of this bias was observed in our survey, as responding fellows reported more participation in GH opportunities than did PDs.

Given the anonymity of the survey, it was impossible to link responses to specific programs and interrogate the features of those programs when exploring what increases support for a GH program. To help compensate for this, we did an extensive web-based search of NPM fellowship program web pages to supplement our survey findings. Web-based searches, however, rely on information found on public web pages, which may be unreliable or out of date. Programs may advertise GH opportunities that they no longer offer, or have trainees participating in GH but not disclose this on their web page. Reviews comparing survey-based and web-based means of identifying availability of GH opportunities across many medical specialties found survey-based responses to show a higher percentage of GH engagement compared with web-based studies [18]. Our study was consistent with these findings, with only 19% of programs advertising GH for NPM fellows on their websites.

Finally, this survey did not examine the important perspective of mentors and trainees in LMICs. Consideration of reciprocal experiences, successful GH engagement models used by other high-income countries, and approaches to enhance international mentoring for US and global trainees should be evaluated. Similarly, the survey did not address rates of long-term engagement of NPM fellows in the GH arena. While 34% of TECaN members responding to our survey stated that they were either "very likely" or "have definite plans" to participate in GH work after fellowship, the true rate of future engagement by NPM trainees is not known. The relationship between fellowship experiences, a program's focus on ongoing partnership, a fellow's personal career goals and longer-term career path remains to be explored. Assessing models of successful long-term involvement in GH for NPM physicians will be important for NPM fellowship programs aiming to train the next generation of neonatal GH clinicians and researchers.

Conclusion

GH is developing as its own discipline within medicine, and neonatal mortality has emerged as a central focus of international efforts to improve childhood outcomes. Future gains in reducing neonatal deaths depend upon active engagement of skilled neonatal experts. NPM fellows are uniquely poised to make a difference in global outcomes, by engaging in global clinical, research, and QI work during their fellowship training. While surveyed fellows and recent graduates place high importance on GH opportunities during fellowship, only a minority engage in GH work. There is variability in GH offerings, with many programs lacking structured education, funding, and research mentorship paired with international experiences. NPM fellowship programs can learn from prior work done by the pediatric residency community, as well as other medical specialties, on how to integrate quality GH training into the curriculum.

Further, focused work to identify and reduce barriers to NPM fellow involvement in GH is warranted.

Author contributions SR conceptualized the design of the study, aided in dissemination of the study to respondents, participated in statistical analysis of the data, and reviewed and revised the paper. GV helped design the disseminated survey, led the website data analysis, and reviewed and revised the paper. DE helped design the disseminated survey, provided expert input on survey results, and reviewed and revised the paper. SK helped design the disseminated survey, provided expert input on survey results, and reviewed and revised the paper. All authors approved the final paper as submitted and agree to be accountable for all aspects of the work.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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