The Gift of Life: Interprofessional Organ Donation Curriculum in Pediatric Critical Care

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ABSTRACT

Background: The number of patients awaiting organ transplantation is high, particularly in Pediatrics, in which available organs are scarce. To maximize organ donation opportunities and to provide quality end-of-life care, clinicians from all professions must be familiar with the process. There continues to be important gaps in core competencies regarding organ donation, including donor criteria and eligibility, timing of referral to organ procurement organizations, neurological determination of death, donation after cardiocirculatory death, and donor management. These gaps affect healthcare providers across multiple professions and are significant barriers to donation.

Objective: We describe an interprofessional curriculum that is designed to teach Pediatric Critical Care Medicine (PCCM) clinicians about the process of organ donation and supporting the families through that process. The approach of families is the purview of organ procurement organization, and the support of the families through the process remains with PCCM clinicians.

Methods: Kern's six-step approach to curriculum development was used to develop, implement, and evaluate an interprofessional curriculum on organ donation in PCCM for physicians, nurses, and respiratory therapists.

Results: Problem formulation and both general and targeted needs assessments were performed through a comprehensive literature review, including review of national

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guidelines and Royal College of Physicians and Surgeons of Canada training objectives. Learning objectives and educational strategies were then outlined using two educational frameworks. After implementation, the curriculum was evaluated using learner self-assessments with a retrospective pre–post design.

Conclusion: After identifying educational gaps contributing to barriers to organ donation, an interprofessional curriculum was developed to increase competency in multiple aspects of organ donation, including team communication and collaboration, with the ultimate goal of promoting a culture of donation while ensuring it is part of quality end-of-life care.

Keywords
interprofessional education; curriculum; organ donation

Since the first organ transplant in 1954, advances in medical care and the dedicated efforts of healthcare professionals in providing care for potential donors and recipients have saved thousands of lives (1). Despite these efforts, a large number of patients die while waiting for transplantation every year in Canada, and thousands remain on the waiting list (2).

Donation is made possible by families who, amid tremendous vulnerability and sadness, choose to save another life. This choice is supported by a team of clinical specialists who focus on providing equal opportunities for donation. This team includes registered nurses (RNs), physicians, respiratory therapists, and organ donation agency personnel (coordinators and transplant support physicians). To establish the competency of those teams and to ensure a culture that supports donation, an interdisciplinary education curriculum is essential.

Organ donation in Pediatrics is much lower than it is for adults, with several factors contributing to this: donor and recipient size mismatch, missed opportunities to approach for donation, and misconceptions regarding organ donor eligibility (3, 4). These barriers underscore the need for an interprofessional education curriculum. A cohesive approach that provides families with compassionate end-of-life care and potential for donation is supported by healthcare provider (HCP) identification of potential donors, timely organ procurement organization (OPO) involvement, family support and education, and optimized medical management of potential donors (5).

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Gaps in organ donation education have been identified as early as medical and nursing school (6). A survey of intensive care trainees revealed that although nearing their transition to independent practice, they had significant knowledge gaps regarding organ donation guidelines and processes (7). These gaps remain present even among practicing clinicians. A needs assessment of Intensive Care Unit (ICU) nurses revealed a demand for further education about donation processes, from the identification of a potential donor to the donation process itself, including donor management (8). Additionally, HCP lack of knowledge of procedures and uncertainty regarding donor criteria were identified as barriers to the donation process (9).

In the Canadian context, the delivery and coordination of organ and tissue donation and transplantation services is the responsibility of the OPO. The approach of the potential organ donor family is always the purview of the OPO and not the healthcare team. The hospitals are mandated to notify the OPO if a patient has died or a physician is of the opinion that death is imminent. The routine notification rate, conversion rate, and eligible approach rate are publicly reported for each hospital. The care of the potential donor and their family, including donor identification, optimal time for the approach, management of the donor, and support of the family, remains the responsibility of the ICU team.

A Canadian survey of ICU and Emergency Medicine physicians and nurses revealed that all four groups of practitioners wanted education on identification and donor referral, family communication, donor management, and donation after cardiocirculatory death (DCD) (10). This same survey also revealed that despite their higher degree of experience, only 83% of ICU physicians feel a high or very high level of comfort managing donors after neurological determination of death (NDD), and less than two-thirds report a high or very high level of comfort with the DCD process, including declaration of death (10). In addition, a survey of Canadian intensivists, nurses, and donation coordinators identified these educational gaps as barriers to organ donation after DCD (11). Finally, despite inclusion in Royal College of Physicians and Surgeons of Canada training objectives, Canadian Critical Care Medicine trainees demonstrate knowledge gaps in NDD, DCD, and donor referral criteria owing to limited exposure to donation and simulation and lack of formal assessment (12).

These findings are at odds with the recognition that interprofessional education is the cornerstone for organ donation success. Despite the obvious need, an interprofessional, comprehensive curriculum founded in educational principles has not yet been described for organ donation. The objective of this paper is to describe an interprofessional curriculum for organ donation in Pediatric Critical Care Medicine (PCCM).

METHODS

To build this curriculum, Kern's six-step approach to curriculum development was used (13). This framework provides a logical and systematic approach to curriculum design, grounded in patient and societal needs, and has been widely used in the field of medical education (13).

The first step in this framework is problem identification and a general needs assessment. We focused our literature review on existing high-quality education programs specific to organ donation.

The second step is the targeted needs assessment, for which we reviewed the literature on organ donation education in Canada to meet the national educational objectives for PCCM published by the Royal College of Physicians and Surgeons of Canada (14–19). Although the healthcare team does not approach the family, they remain responsible for many aspects of the donation process, including management of the donor and support to their family. Establishing and maintaining the knowledge and skills of HCP promotes the continuum of care and the success of the donation program.

We combined steps 3 and 4 by defining our goals and objectives and mapping them with their respective educational strategies. We then describe step 5, how the curriculum was implemented longitudinally with discussions with the main stakeholders and different HCP groups. The final step in this framework consisted of the curriculum evaluation. For this, we used a retrospective pre–post design (20). This design has been shown to be effective in the context of faculty development, and its validity in assessing learning has been demonstrated in further studies (21, 22). Although this mode of evaluation depends on self-assessment, the self-assessment of the learners only occurs at the end of the educational program, facilitating a more accurate learning benefit in a particular topic. This accurate identification of learning is helpful in the evaluation of educational programs, and the feedback it provides is useful to future program decision-making (21, 22). We graphically presented the median scores by practitioner in the pre and post self-learner evaluation. Scores were compared across all learners and by practitioner using a Wilcoxon signed rank sum test (P values are presented, and significant difference is $P < 0.05$).

RESULTS

Our general and targeted needs assessment (steps 1 and 2 of the curriculum framework) is described in the BACKGROUND section. The findings resulting from this literature review, together with the review of national guidelines (14–19), informed the goals and objectives that were targeted in our curriculum (Table 1).

Once the goals and objectives were created, we built a blueprint map to match each objective with educational methods based on educational frameworks (Table 1). For these, we used Merrill's first principles of instruction as a conceptual framework to maximize learning and the Canadian Interprofessional Health Collaborative framework to design the interprofessional curriculum (23, 24). Merrill's framework is composed of interrelated principles that maximize student learning: *1*) learning from relevant real-world problems, starting with simple tasks and progressing to more complex tasks; *2*) activating prior knowledge; *3*) demonstrating new knowledge in the context of real-life problems; *4*) applying new knowledge to solve new problems and tasks; and *5*) integrating new knowledge into practice through reflections and discussions (23).

The Canadian Interprofessional Health Collaborative developed an interprofessional competency framework with six important domains: interprofessional communication; patient-, client-, family-, and community-centered care; role clarification; team functioning; collaborative leadership; and interprofessional conflict resolution (24). This framework was used to build the

Table 1. Goals and objectives of the curriculum and educational approach

Educational Methods	Educational Frameworks (23, 24)	Goals and Objectives	Applications
Lectures	Merrill: activation and demonstration CIHC*: role clarification	1. To understand the provincial process of organ donation 2. To gain knowledge with the principles of NDD and DCD 3. Movements and suspected spinal reflexes in death determined by neurological criteria 4. Principles of donor management (16–19)	- Academic half-day lectures to residents, fellows - Didactic lectures to RN and RT groups - Video of NDD examination
Simulation	Merrill: application CIHC: role clarification, team functioning, collaborative leadership	1. Demonstrate the ability to examine the minimum clinical criteria for NDD as well as perform ancillary tests and be able to complete the declaration and documentation 2. Ability to create an appropriate setting to deliver bad news to families 3. Ability to use nonverbal and verbal stimuli to clearly and appropriately deliver the bad news to families 4. Ability to respond to parents' emotions 5. Ability to summarize for parents and have a strategy for moving forward 6. Supporting families through the process of DCD with the donation coordinator for the family and the bedside providers 7. Compare and contrast DCD and NDD 8. Approach withdrawal of life-sustaining therapies 9. Explaining principles of donor management to families 10. Build communication skills in end-of-life care and adapt communication skills in end-of-life care to a virtual platform during a pandemic 11. Demonstrate the ability to recognize spinal reflexes and formulate an approach to explain the movements to the family and other healthcare providers 12. Identify what information should be deferred to the donation coordinator for consistency and accuracy of donation assessment (16–19)	- Interprofessional simulation sessions
Supervised clinical experience for trainees and new nurses and respiratory therapists	Merrill: application CIHC: role clarification, team functioning, collaborative leadership, interprofessional conflict resolution	1. Perform NDD declaration - Exclude reversible causes of coma - Assess brainstem reflexes and response to pain - Perform an apnea test - Use ancillary testing when appropriate - Apply guidelines for the determination of NDD status - Adhere to regulations regarding NDD declaration 2. Apply principles of donor organ - Develop and implement management plans to maintain organ donor homeostasis with appropriate hemodynamic, respiratory, temperature, urine output, fluid, electrolyte, and glucose targets - Work effectively with organ procurement organization personnel, transplant surgeons, and in-hospital diagnostic services to ensure complete evaluation of individual organ/tissue suitability for transplant - Establish plans for ongoing care of potential organ donors, incorporating considerations of patient comfort and family concerns - Manage ethical issues encountered in the clinical setting (15)	- Entrustable professional activities
Activities integrated in clinical setting	Merrill: integration CIHC: team functioning, collaborative leadership, interprofessional conflict resolution	- To review key principles of donor management - To develop an approach to communication with family at end-of-life regarding WLST, NDD, and DCD - To identify potential donors to OPO - To understand the importance of communication with OPO when approaching end-of-life (early referrals) - To understand appropriate approaching planning for donation opportunity to be presented to a family	- Case debriefs - Interprofessional case discussion rounds - Mortality reviews including opportunities to improve donation processes

Table 1. *Continued.*

Educational Methods	Educational Frameworks (23, 24)	Goals and Objectives	Applications
		- To understand when a donation coordinator takes lead on communication regarding donation process and organ acceptance for potential recipient - Management of WLST/end of life (16–19)	

Definition of abbreviations: CIHC = Canadian Interprofessional Health Collaborative; DCD = donation after cardiocirculatory death; NDD = neurological determination of death; OPO = organ procurement organizations; RN = registered nurse; RT = respiratory therapist; WLST = withdrawal of life-sustaining therapies.
After identifying the goals and objectives of the interprofessional curriculum, we chose educational methods based on two established educational frameworks and applied them using different modalities.
*Interprofessional communication and patient-, client-, family-, and community-centered care are two domains that support and affect all others (24).

curriculum's interprofessional educational activities.

The curriculum was implemented longitudinally and across multiple professions, after discussion with stakeholders from all professions (Figure 1). The curriculum integrates a variety of modalities, such as didactic lectures, simulation, and clinical encounters. The didactic lectures are given early in PCCM fellowship, nursing, and respiratory therapy training as part of a well-established rolling curriculum, with regular review sessions on educational days. Simulation scenarios were created to supplement infrequent clinical experiences. The topics, objectives, and scenarios were prepared and facilitated by interprofessional faculty. The curriculum integrates case-based discussions of clinical practice that occur regularly (e.g., case debriefs occur after each organ donation case to review clinical management as well as ethical issues and emotional aspects of the case, interprofessional case rounds occur more frequently to discuss all patients eligible for donation and their outcomes, and mortality reviews target quality assurance). Members of the nursing, respiratory therapy, and physician groups attend the educational sessions and discussions together to promote team-based learning and function. Simulation resources, such as simulation technicians and access to a simulation center and equipment, were provided from the hospital for training of the HCPs. Interprofessional faculty time is allocated by the Department of Critical Care, as all educators have protected time to dedicate to teaching HCPs. The supporting OPO for our institution has a system in place for providing a designated coordinator dedicated to supporting the hospital program, including the education of HCPs, dissemination of new donation processes, and implementation of new program initiatives. RNs and respiratory therapists participating in the simulation program were reimbursed for their time by the department. There are approximately 80 full-time nurses in our pediatric ICU. The RNs that participated were selected to be either new hires or in the Clinical Support Nurse role (an RN who does not have an assigned patient, who is selected for their clinical expertise, and whose role is to support the other RNs during their shift). By choosing experienced nurses in a support role and new nurses, we aimed to maximize the impact of the simulation curriculum. The didactic lectures for all HCPs were delivered during their protected education days. Interprofessional case rounds occur daily for 1 hour in our department. The cases

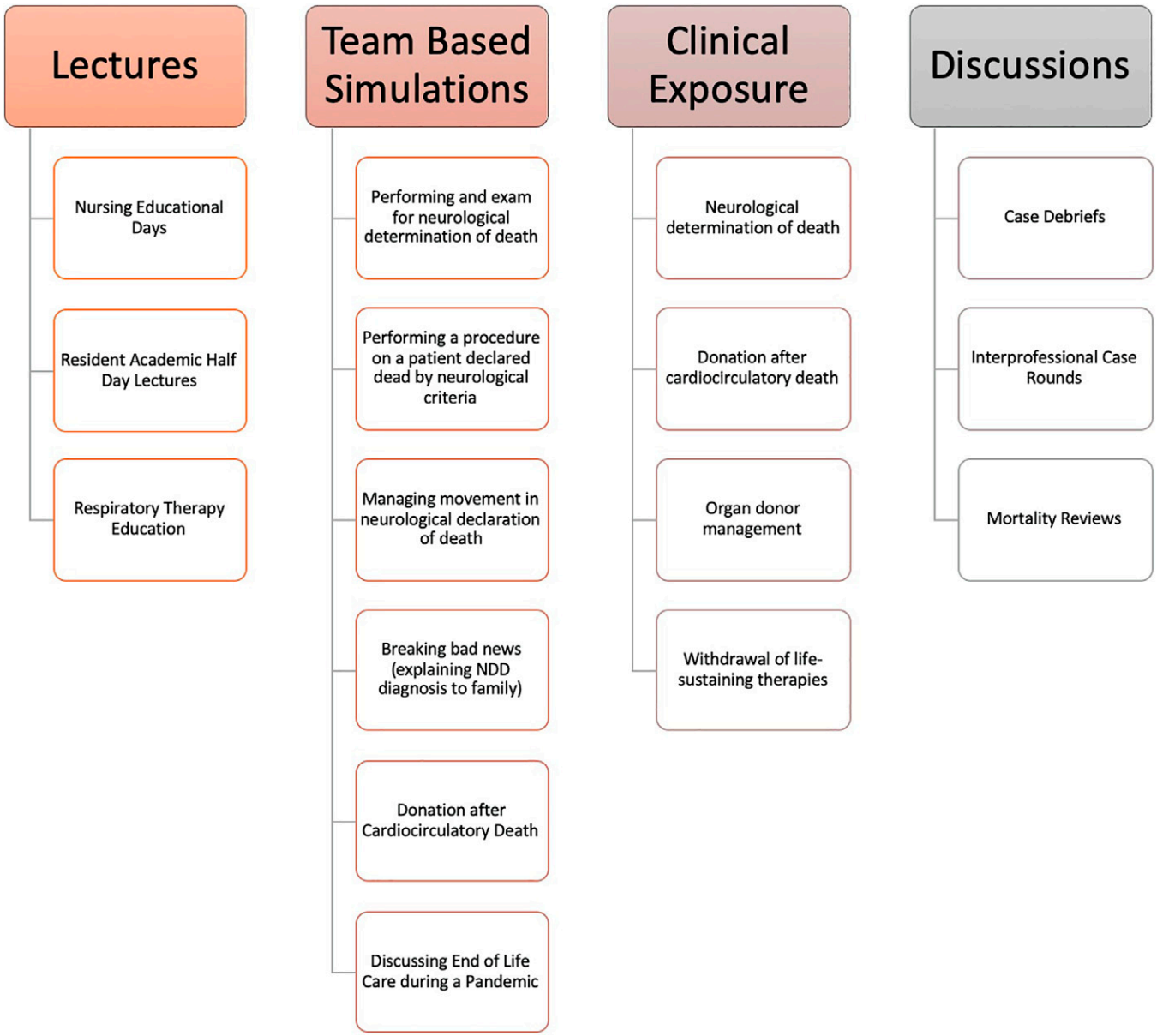

Figure 1. Implementation of the curriculum. This figure describes the longitudinal implementation of the curriculum across multiple healthcare professional groups using a variety of educational modalities. NDD = neurologic determination of death.

are selected for their relevance and impact. The bedside RNs and respiratory therapists are excluded from clinical duties during that hour to participate in the discussion of their case, and all trainees attend these rounds.

To evaluate the interprofessional curriculum, we used a retrospective pre–post design after the members of interprofessional teams had completed the simulation scenarios. There was a total of 130 participants in the simulation curriculum (23 junior trainee physicians, 23 senior trainee physicians, 22 nurses, and 25 respiratory therapists). There was a positive trend seen in the participants self-reported knowledge and skill level in each topic after participation in the simulation portion of the curriculum from an average ability to manage the case before

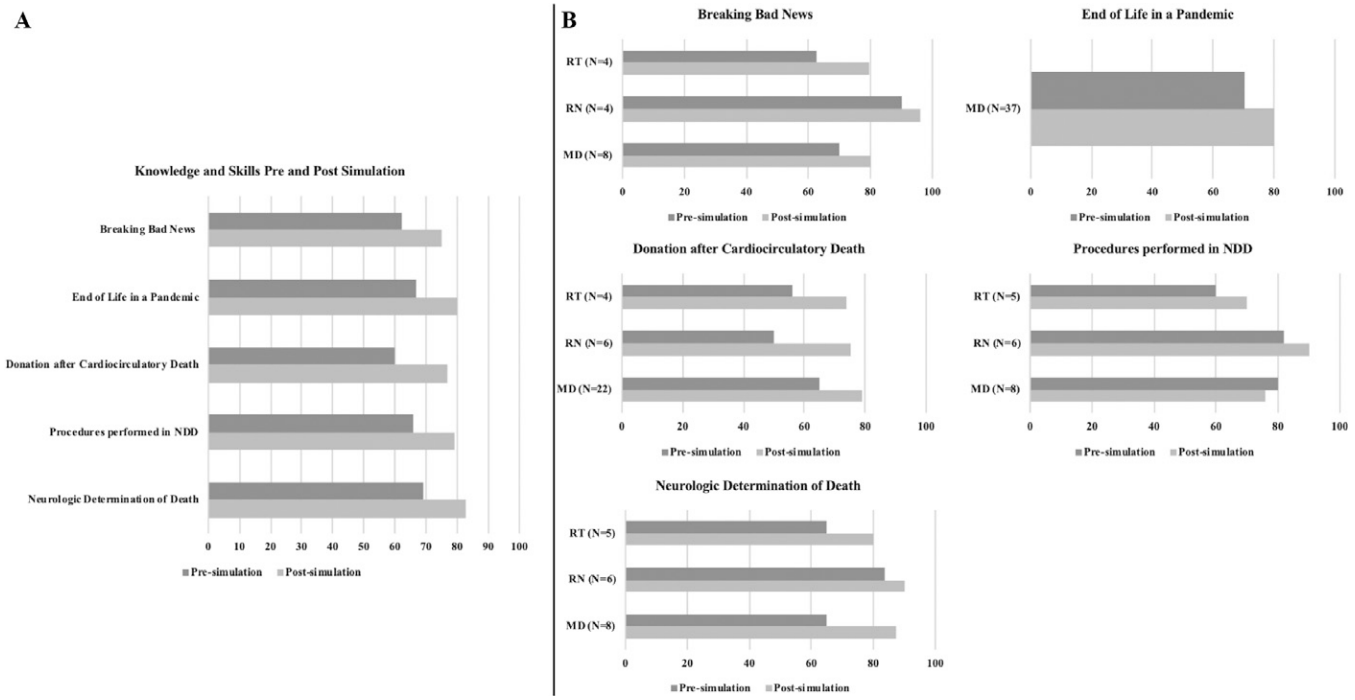

Figure 2. Self-assessment scores before and after simulation scenarios. (*A*) The median scores of self-assessment of all practitioners before and after the simulation scenario. All scenarios show improved postsimulation scores. (*B*) The median scores presented by each practitioner group performing the different simulation scenarios. All practitioners showed improved scores on self-assessment in all simulation scenarios, except the MD group in the procedures performed in NDD station. MD = medical doctor; NDD = neurological determination of death; RN = registered nurse; RT = respiratory therapist.

simulation of 65 (on a scale of 1–100) to an average of 79 after the simulation practice (Figure 2). A statistical comparison of scores showed a significant difference in self-learner knowledge assessments in all scenarios: delivering bad news ($P = 0.002$), DCD ($P < 0.0001$), family engagement ($P < 0.0001$), NDD ($P = 0.0001$), and procedures in NDD ($P < 0.0001$). We did not collect data from clinical settings such as case debriefs, case discussions, and mortality review conferences.

DISCUSSION

This report summarizes an approach to an interprofessional organ donation curriculum in PCCM. Our contribution to the literature is in two fronts: we provide an example of a curriculum in organ donation that is a high-stakes and low-frequency occurrence (our pediatric institution has an average of five donors per year, including NDD and DCD) and an example of how to build a successful interprofessional curriculum. It was obvious from our literature review that there is a significant gap in provider knowledge, comfort, and skills, and that there is a need for an educational curriculum in organ donation in Critical Care Medicine to address this. Building on this gap, we describe an example of a curriculum that other educators may adopt using Kern's framework, which is widely used in medical education. Although this curriculum serves the needs of the institution where it was developed, we provide a curricular map that other programs can use and modify for their own local needs and knowledge gaps. The strength of an educational program depends on its feasibility. A significant step in Kern's framework is the targeted needs

assessment that requires each institution to look at their own processes and competence of HCPs in this particular area to decide which interventions would be the ones of most importance, especially in the context of limited resources. Education program planners should also look at what educational infrastructure already exists (rounds, teaching, simulation) that can be modified to include new educational goals.

Knowledge and skills surrounding organ donation may not be exercised regularly, as clinical exposure to donation may be intermittent and inconsistent. The paucity of clinical exposure threatens protocol adherence and limits our collective objective to appropriately identify potential donors with timely referral to OPO for eligibility assessment and approach while providing appropriate donor management. The objectives of this curriculum were identified by reviewing literature, prior clinical cases, and missed opportunities and by involving an interprofessional team who best understood the culture of the unit and its educational gaps. Following the objectives, a variety of educational strategies was used (didactic, simulation, clinical exposure debriefing) to ensure every opportunity for donation was recognized. Educational activities had a ripple effect; not only were HCPs educated about organ donation logistics for successful transplantation, but the curriculum also fostered a unit-wide donation culture by creating awareness to ensure it remained a part of quality end-of-life care.

We currently practice in dynamic and complex healthcare systems that demand an ability to work in interprofessional teams in pursuit of high-quality patient care. Interprofessional education has been described as when "two or more professionals learn about, from and with each other to enable effective collaboration" (25), and, naturally, an opportunity and ability to train in teams contributes thereafter to our ability to work better as a team. Organ donation requires the collaboration of a team of professionals and, similarly, the education of these professionals. Our curriculum was successful because of three major factors: *1*) the culture of the institution supports interprofessional education and collaboration, *2*) there is a designated hospital coordinator from the OPO tasked with local education and awareness, and *3*) there is a sound educational design.

Recognizing that education plays a central role in the donation process, it was important to build a curriculum based on effective and validated education frameworks. The interprofessional target of this curriculum made it important to use an interprofessional competency framework to improve competencies such as communication, collaboration, and leadership, in addition to medical knowledge, all of which, in return, lead to improved patient outcomes. Furthermore, we used multiple methods of education to target different objectives. As best practice guides in education have stated, we also integrated tools such as simulation to be an important but not isolated part of the curriculum to increase the long-term sustainability of the curriculum (26).

Finally, although the development and implementation of this curriculum have been important, and although the initial curriculum evaluation demonstrated positive results, this process, as with any curriculum, is not static. Looking ahead, we plan to continue to use our experiences during lectures, clinical encounters, simulations, and discussions to inform further gaps in knowledge and obstacles to donation. Continued

involvement from all major stakeholders, including the OPO, will allow our curriculum to be an effective, up-to-date, and collaborative curriculum.

There are several limitations to our report. We are fortunate to have the resources, support, and a culture conducive to implementing interprofessional education curricula, so the implementation of the program was fairly straightforward. We can imagine that the process would be more complex if this was one of the first interprofessional programs to be implemented. We also did not evaluate specific aspects of the curriculum to identify which ones had the highest impact to increase the generalizability of our findings. This would be very important in another context in which resources such as education instructors, simulation resources, and protected time of HCPs to dedicate to training might be limited. The evaluation of the curriculum presents limited data gathered after the simulation program. A robust evaluation should include data from clinical practice, and that is our next step in this project. Although many frameworks for program evaluation exist, a comprehensive one should include quantitative data, such as improvement in publicly reported data and review of management of the donor and their family from our "Morbidity and Mortality Conferences," as well as qualitative data, such as interviews with HCPs and families.

Conclusions

This is an example of a successful interprofessional organ donation curriculum that addresses an important gap in the literature regarding this high-stakes and low-frequency clinical encounter that requires competency for comprehensive donor identification and management and the delivery of high-quality care at the end of life.

Author disclosures are available with the text of this article at www.atsjournals.org.

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