

# Team Cognition As a Means to Improve Care Delivery in Critically Ill Patients With Cancer After Hematopoietic Cell Transplantation

Nathan J. McNeese PhD Nandita Khera MD MPH Sara E. Wordingham MD  
Noel Arring DNP Sharon Nyquist MS RN Amy Gentry MS RN Brian Tomlinson MPA  
Nancy J. Cooke PhD and Ayan Sen MD MSc

Arizona State University Mesa; Mayo Clinic  
Arizona Phoenix AZ; and CancerCare New  
York NY

## Abstract

Hematopoietic cell transplantation (HCT) is an important and complex treatment modality for a variety of hematologic malignancies and some solid tumors. Although outcomes of patients who have undergone HCT and require care in intensive care units (ICUs) have improved over time, mortality rates remain high and there are significant associated costs. Lack of a team-based approach to care, especially during critical illness, is detrimental to patient autonomy and satisfaction, and to team morale, ultimately leading to poor quality of care. In this manuscript, we describe the case of a patient who had undergone HCT and was in the ICU setting, where inconsistent team interaction among the various stakeholders delivering care resulted in a lack of shared goals and poor outcomes. Team cognition is cognitive processing at the team level through interactions among team members and is reflected in dynamic communication and coordination behaviors. Although the patient received multidisciplinary care as needed in a medically complicated case, a lack of team cognition and, particularly, inconsistent communication among the dynamic teams caring for the patient, led to mixed messages being delivered with high-cost implications for the health-care system and the family. This article highlights concepts and recommendations that begin a necessary in-depth assessment of implications for clinical care and initiate a research agenda that examines the effects of team cognition on HCT teams, and, more generally, critical care of the patient with cancer.

## INTRODUCTION

The Institute of Medicine in 2013 reported that the cancer care delivery system is in crisis due to a growing demand for cancer care, increasing complexity of treatment, a shrinking workforce, and rising costs.<sup>1</sup> Advances in the treatment of cancer have led to an increase in survival for most cancers, but have also resulted in an inflation of life-threatening complications that require care in an intensive care unit (ICU) at some point in the cancer care

continuum.<sup>2</sup> As a result of high morbidity and mortality rates in these patients, the economic and psychosocial burdens for these extremely sick patients and their families can be immense.<sup>3</sup>

Hematopoietic cell transplantation (HCT) is an important treatment modality for a variety of hematologic malignancies and some solid tumors, and provides a stark example of the extreme financial and emotional stress that is borne by patients with cancer. By itself, HCT is an expensive treatment modality, with ICU



DOI: [10.1200/JOP.2016.013672](https://doi.org/10.1200/JOP.2016.013672);  
published online ahead of print at  
[jop.ascopubs.org](http://jop.ascopubs.org) on September 20  
2016.

expenses contributing a large proportion of the overall costs<sup>4</sup> and offering an important opportunity for cost containment by avoiding use of unnecessary care.<sup>5,6</sup> There has been a dramatic increase in the number of autologous and allogeneic procedures performed.<sup>7</sup> Although outcomes of patients who have undergone HCT and required ICU care have improved over time, mortality rates remain very high, with poor long-term survival.<sup>8</sup> Due to the large number of multidisciplinary providers involved with disparate participation in decision-making, the potential for poor communication and coordination of care is a common problem in HCT teams. Interdisciplinary communication within a team is crucial for the development of negotiated shared-treatment goals and patient outcomes.<sup>9</sup>

In this article, we describe the case of a patient who had undergone HCT and was in an ICU setting in which ineffective team cognition was manifested in inconsistent team interaction and lack of shared goals among the various stakeholders delivering care. This proved to be detrimental to patient autonomy and satisfaction, and to team morale, ultimately leading to poor quality of care. Although we use the setting of HCT here, the scenario is relevant to any patient with cancer being cared for in the ICU.

## CASE SUMMARY

A 57-year-old woman, JM, with a history of acute myelogenous leukemia received a mismatched unrelated-donor HCT. She developed pneumonia 7 days after transplantation and was started on broad-spectrum antibiotics per the infectious disease (ID) specialists. The oncology team and ID physicians expressed hope to the patient and family that her condition would improve after the transplant was engrafted.

JM progressively deteriorated, however, and required endotracheal intubation and mechanical ventilation. Before emergent intubation, the critical care physician informed the family that JM would likely die while receiving ventilatory support and, therefore, palliative care (PC) consultation should be considered for concurrent supportive care. However, the family wished to pursue all aggressive measures because the oncologists remained positive about her prognosis. She subsequently developed septic shock and progressive acute renal failure requiring renal replacement therapy. Per the nephrologist, the renal failure was medication induced and this would likely be reversible once the nephrotoxic agent was stopped.

One night, JM's blood pressure dropped and the critical care team asked the nurse to hold renal replacement therapy because of hypotension. The next morning, the nephrologist told the nurse, in front of the family, that it should not have been held. Different opinions existed among the oncologists themselves in terms of overall prognosis. On a particular shift, the intensivist and oncologist discussed "code status" with the patient's husband, and the potential need for tracheostomy and a long-term ventilator facility in the future. JM's husband expressed frustration with the differing opinions and asked, "Who's in charge?" The husband also reported conflict between his son and daughter as to what course they wanted to take. The son was in school to be a physician assistant and he reported having seen patients who survived multiorgan failure. The daughter did not want to let her mother suffer anymore. The patient's family asked the nurse if she believed JM was suffering. The nurse replied honestly that it was possible, but she was doing what she could to keep JM comfortable. With no further clinical improvement, JM's family designated that a "chemical code" be called only in case of cardiorespiratory arrest, but they did not wish to remove her from ventilatory support. They also wanted a second opinion from another well-known cancer center.

Despite 1 month of maximal care in the ICU, JM continued to progressively decline with multiorgan failure. A PC consultation occurred 2 days before she progressed to asystolic cardiac arrest and was pronounced dead.

## TEAM COGNITION IN HEALTH CARE

Team cognition is cognitive activity that occurs at the team level. More specifically, team cognition is the dynamic interaction (communication and coordination) that occurs among team members (often working with technologies) during work in a real-world context.<sup>10</sup> Various perspectives on team cognition have emphasized shared mental models,<sup>11</sup> situational awareness,<sup>12</sup> distributed cognition,<sup>13</sup> and interactive team cognition.<sup>10</sup>

For a team to act in concert to achieve common goals, the team must share team- and task-related information to build and maintain a shared mental model of the situation.<sup>11</sup> Because communication is essential to team performance, effective team cognition has a communication "overhead" associated with dynamic exchange of information among team members.<sup>14</sup> Team cognition is not the product of isolated processes in an individual's mind, but rather a product of team level activity (eg, physicians must plan on the basis of their

own knowledge, but also the knowledge of other physicians and specialists, nurses, and patients) and multiple artifacts (eg, situation assessment relies on information such as data stored in electronic and paper records), often over an extended time.<sup>15</sup> Thus, there are many factors tied to effective team cognition.

### Application to the Case

Although JM received multidisciplinary care, as needed, in a medically complex case, a lack of effective team cognition related to the inconsistent communication among the dynamic teams led to mixed messages being delivered to the family. This resulted in increased anxiety, conflict, and distress among the care team, which then led to inappropriate aggressive care with high cost and psychologic implications for the health-care system and the family. The various issues associated with poor team cognition in this case are listed in [Table 1](#) and summarized in the following four sections.

### Team Complexity

Katzenbach and Smith define teams as “a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable.”<sup>16</sup> The health-care team described in this case is comparatively complex. It is quite large (approximately two to 10 subteams) and composed of multiple specialists from several disciplines, each with differing perspectives. Adding to the complexity of the team is its dynamic team membership. Each specialty represented on the team involves multiple individuals who may move on and off the team over time. “New” team members often have limited knowledge of the patient or the care that has been given. In addition, when team members move off the team, there may be decay of handoff information,<sup>17</sup> further limiting the development of team cognition.

By definition, team members have defined roles and are interdependent (ie, all roles are necessary). However, this case highlights role confusion and lack of interdependence. Although the oncologist may feel that they have primary ownership of patient’s clinical management, as the patient progresses toward critical illness, the intensivist may feel that they are more appropriately versed in decision-making related to organ failure and success or failure of aggressive life-support therapies. The other key contributors (eg, nephrologist, ID physician) may offer their opinions to the families without conferring with others.

Although multiple teams were involved in JM’s care, PC was delayed and may have provided concurrent supportive care.<sup>18</sup> They could have assisted in shared decision-making with the patient and family to help define preferences that aligned with the patient’s goals and values prophylactically, as opposed to in times of clinical crisis.

Furthermore, the hierarchical practice of medicine may lead to the bedside nurse’s valuable input being undervalued in the team.<sup>19</sup> The concept of “power distance” (ie, difficulty challenging authority<sup>20</sup>) may lead to loss of valuable input from a key member of the health-care team, who, by virtue of their constant bedside presence, may provide insight not perceived by the physicians. Finally, one must also consider the patient’s family in the complex health-care team. The patient care advocate can be a resource for the many lifestyle, family, and quality-of-life decisions that must be made. They can provide continuing education to the family and step into the process as mediator, negotiator, coach, counselor, and triage agent.

### Dynamic Communication and Coordination Challenges

Current research indicates that communication and coordination failures lead to increases in patient harm, length of stay, and resource use, as well as more intense caregiver dissatisfaction and more rapid turnover.<sup>21,22</sup> In JM’s case, it is clear that a number of communication and coordination issues persisted, leading to increased communication breakdowns and reflecting poor team cognition. The critical care physician noted that JM would likely die while she still was receiving ventilator support, yet the oncology team was positive about her recovery; thus, the family received mixed messages.

During critical illness of a patient who has undergone HCT, changes in the clinical course can be fairly dynamic and not all decisions can be subject to the entire team’s agreement or approval at the time of occurrence. However, some of the major decisions need to be communicated among the relevant team members. In this case, the decision of holding dialysis overnight was an appropriate one made by the ICU team, but a call to the nephrologist would have been appropriate to provide an update about the change in clinical status.

### Goals and Perspectives of Different Specialists May Not Align

As noted, HCT teams are extremely heterogeneous. In theory, this is viewed as a benefit in providing multidisciplinary care

**Table 1. Issues and Recommendations of Team Cognition Implications for Practice** improving team cognition to enhance team-based care)

| Team Cognition Issue  | Description   | Recommendation   | Specific Steps  |
|---|---|--|---|
| Team complexity   | Heterogeneous: highly diverse set of different specialists                      | Increase awareness of the “team”   | Provide as much continuity as possible by maintaining the same providers  |
|   | Interdependent: team members have specific roles                                | Implement decision-making and communication protocol interactive team cognition <sup>10)</sup> | Establish clear roles and responsibilities  |
|   | Dynamic: team and tasks are constantly changing                                 |  | Establish pivotal role of nurse as a facilitator of team communication and coordinating medical team and family conversations |
|   | Large number of team members  |  |   |
|   | Lack of role clarity  |  |   |
|   | Lack of involvement of some key providers in decision-making eg, nursing)       |  |   |
|   | Lack of timely involvement of some key providers eg, palliative care)           |  |   |
|   | Decay of handoff information  |  |   |
|   | Interaction with larger health-care system and multiple organizations           |  |   |
| Dynamic communication and coordination challenges             | Family is a team that medical team must interact with                           |  |   |
|   | Individual decisions often not aligned with team perspective                    | Increase awareness of the “team”   | Early involvement of palliative care  |
|   | Lack of clear goal or direction to orient individual decisions                  | Implement decision-making and communication protocol interactive team cognition <sup>10)</sup> | Develop a workflow to enable team communication before discussion with patient/family   |
|   | Individual decisions are often not communicated with rest of team               |  | Establish pivotal role of nurse as a facilitator of team communication and coordinating medical team and family conversations |
|   | Lack of communication due to inadequate communication channels and lack of time |  |   |
|   | Lack of clarity of who should have team membership                              |  |   |
|   | Confusion on who to involve and when  |  |   |
|   | Specific issues with coordinating palliative care early in process              |  |   |
|   | Limited communication among providers   |  |   |
|   | Lack of value associated with certain team members roles and perspectives       |  |   |
| Goals and perspectives of different specialists may not align | Individual decisions often not aligned with team perspective                    | Develop shared perspective among specialists   | Standardized, evidence-based algorithms for admission to ICU and management of common problems                                |
|   | Conflicting viewpoints and opinions can complicate team cognition               |  | Eliciting preferences from the patient and family at the outset   |

continued on following page)

**Table 1.** Issues and Recommendations of Team Cognition Implications for Practice (improving team cognition to enhance team-based care) (continued)

| Team Cognition Issue                                  | Description  | Recommendation                                 | Specific Steps   |
|---|--|--|--|
|   | Different goals and perspectives lead to conflicts within team and family, specifically confusion among family   |  | Develop shared mental models to share perspectives<br>Set collaborative and clear goals but maintain situational awareness and flexibility<br>Acknowledging support from other team members when with patient/family |
| Role of communications technology and medical records | EMRs may not capture granular data of patient's clinical trajectory, leading to false assumptions<br>Communication tools can be helpful but also may impede team cognition | Increase awareness and collaboration of "team" | Development of an interactive team white board for real-time collaborative decision-making<br>Next generation of EMRs to support automation of decisions/tasks   |

Abbreviations: EMR = electronic medical record; ICU = intensive care unit.

grounded in the power of multiple perspectives being used to make decisions. Yet, team members might not develop shared knowledge, because of their conflicting viewpoints and medical perspectives. Compromises in perspectives and opinions must be made to develop a shared, multidisciplinary patient-care plan. Often providers speak to patients and families from different perspectives, which cause confusion and conflict in both the care team and the family.

### Role of Communications Technology and Medical Records

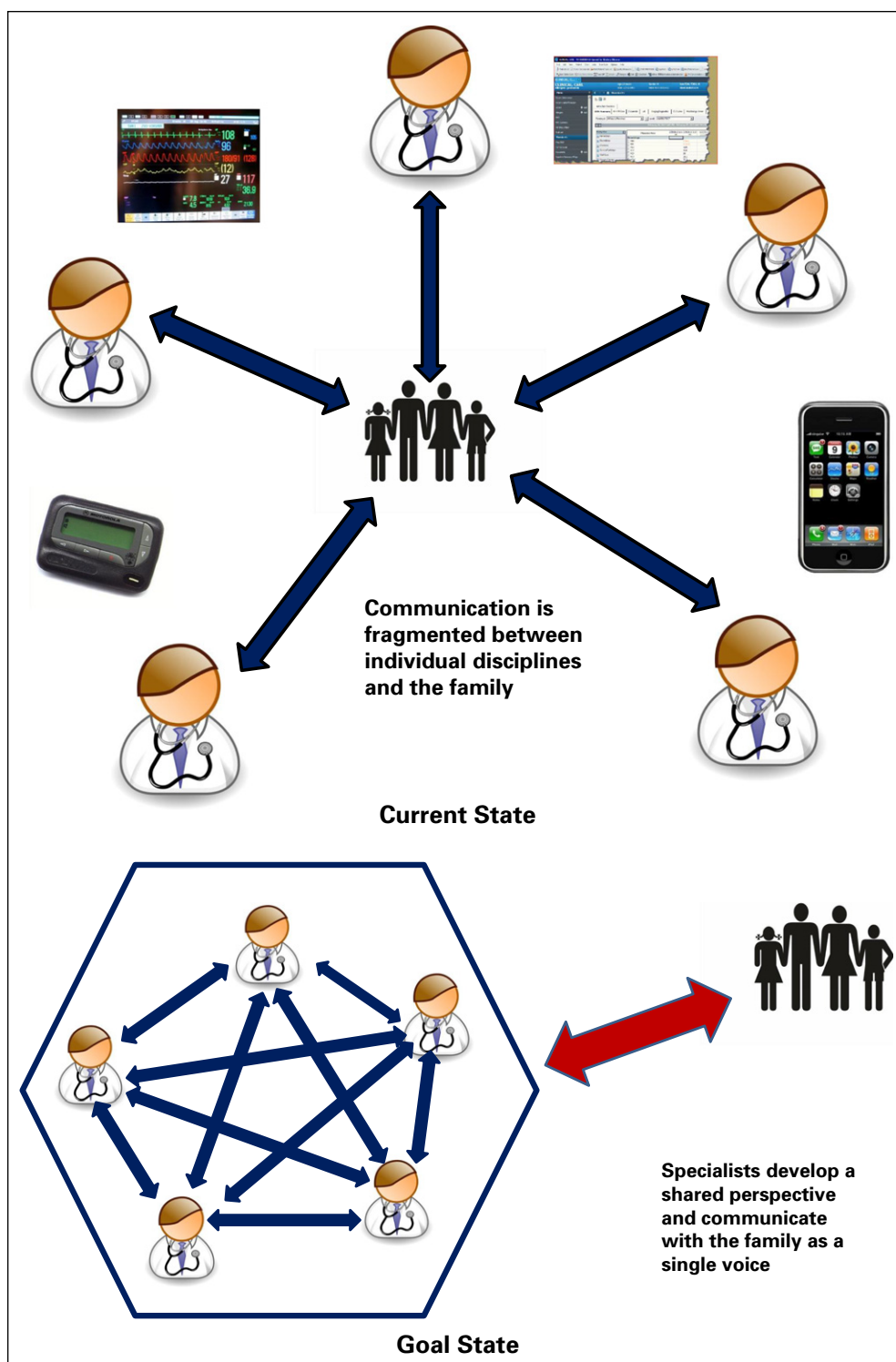
Communications technology and electronic medical records have a significant role in facilitating or impeding team cognition. The advent of electronic medical records (EMRs) has increased accessibility of patient information. Unfortunately, in most implementations, granular pieces of information from the ICU fail to find a place in the EMR. Critical care is characterized by periods of heavy load of urgent tasks, and manual entry of detailed information into the medical record is, sometimes, postponed or dropped. Often, it takes time to go through data when using a hunt-and-peck gathering technique to obtain a complete perspective of patient's trajectory. Making snapshot assessments on the basis of incomplete data is common. In our case, the hemodynamic instability from dialysis was not captured, because the EMR vital signs were set to hourly updates, and JM's blood pressure improved after stopping dialysis. The nephrologist was unable to determine this from the EMR and made an

assumption about inappropriate withholding of therapy, which was communicated to the family. Similarly, sometimes discussions take place between providers and between providers and family, and some of them may not be well documented in the EMR, leaving false assumptions to be created.

Communication tools can also be challenging. Face-to-face communication, arguably the best mode of achieving a shared understanding of a patient's trajectory, may be difficult because of time constraints and constant multitasking of physicians and nurses. Tools like pagers, e-mail, and telephone calls can be of value but may fail if they are not returned or not applied appropriately.

Caring for a critically ill patient who has undergone HCT highlights the challenges of team cognition and team-based care. Currently, and far too often, an integrative team-based plan of care is not implemented. Instead each "team" member has his or her own perspectives and fails to communicate with other team members (Fig 1). This results in fragmented communication within the team and multiple differing opinions are communicated to the family. A shared perspective would allow the HCT team to communicate with the family as a cohesive and single voice (Fig 1). This approach can be translated to other teams managing patients in the ICU or out of the ICU setting.

Advance care planning is warranted when the patient is able to actively participate in the discussions and can be an important frame of reference for the family and care team if



**FIG 1** Team cognition for care provider teams to speak to patient and family as a single voice.

major complications occur. A proactive, rather than a reactive, approach to goals-of-care discussions and development of a care plan that includes “what if” scenarios is paramount to

improve team cognition. Involving the oncologist, patient’s primary care physician, PC team, and the critical care team early in the process would likely promote effective team



cognition. The conversation should incorporate appropriate risk communication and potential trajectories.

Planned, routine care conferences may help the team come together to share opinions, reach consensus on common goals, and provide objective information to the family in a cohesive manner. Discussion about the case from each team member's perspective can help educate everyone and resolve or defuse conflicts that might possibly occur between the family and the team or even within the team, thereby improving quality of care. Table 1 suggests some approaches to address ineffective team cognition, as was reflected in the current case. The current health-care environment seems conducive to supporting the structures and processes that can help deliver patient-centered care by incorporating favorable reimbursement policies to implement some of the steps mentioned.<sup>23</sup>

One way that the health-care domain is already attempting to develop shared perspectives of patient care is through multidisciplinary team (MDT) conferences. The MDT model has been used to increase coordination between different treatments and providers.<sup>2</sup> The main objective of these teams is to meet to find alternative treatment paths and help create an effective communication channel with the care providers and the patient.<sup>9</sup> MDT meeting decisions are shared with the patient after the final treatment plan is agreed on.<sup>24</sup> Previous literature has highlighted that the MDT model for providing cancer care helped increase survival rates,<sup>25,26</sup> patient satisfaction,<sup>27</sup> adherence to clinical guidelines,<sup>28</sup> and promotion of effective use of resources,<sup>28</sup> and decreased the waiting time to treatment.<sup>29</sup> In addition to these improvements, MDT meetings improved consensual team decision-making and effective team work.<sup>30</sup>

Moving forward, we should consider new and innovative ways to support MDTs during critical illness, with the aim of supporting team cognition. Specifically, new technologies should be developed that support information flow within and among all team members regardless of time and space. The traditional MDT model consists of a weekly meeting, but these meetings cannot always be conducted if a critical time-pressured situation arises. In these situations, technologies can help extend the notion of the MDT model.

## IMPLICATIONS FOR RESEARCH

The concepts and recommendations outlined in this article are only the beginning of a necessary in-depth research agenda that examines team cognition on HCT teams. We know, on the basis of over 30 years of team cognition research,<sup>31</sup> that there

are interventions that improve team cognition. Many of these interventions can be evaluated in HCT teams. Approaches and perspectives can then be translated to cancer and noncancer ICU patient-care teams.

## Communication Structures in HCT Teams

Ethnographic studies have led to the generation of much knowledge within the medical domain,<sup>32</sup> yet in the context of HCT teams, there is a paucity of available literature. Specifically, there is a need to perform an ethnographic study of the communication structure that can provide a richer perspective on how clinical microsystems actually function in HCT practice. Understanding the role of the influence of multiple layers of clinical handoff structures on shared decision-making specific to teamwork is necessary.

In addition, through ethnographic studies, the role of early involvement of PC can be assessed with outcome measures such as nursing distress and family perception of end-of-life care. There is also an opportunity to determine the bedside nurse's role in these dynamic, high-stress situations. More descriptive studies are necessary to better learn how nurses can champion teamwork while proactively espousing team cognition among teams. Investigating nurses' current challenges and frustrations can assist in developing answers to enable their empowerment as facilitators of team cognition and teamwork.

## Communication Tools

Along with the communication structure, investigations of the tools used in team cognition and teamwork are necessary. A mixed-methods approach to assess how current or future communication methods can benefit team cognition in care of a patient who has undergone HCT would be beneficial for EMR developers and usability experts. Tools will need to be developed to support awareness of information across team members, resulting in "updated" team-level cognition. One potential tool to support team cognition in HCT and oncology teams could be a "black box" communication system that can be assessed for asynchronous communication similar to other domains.<sup>33</sup> In addition, audio recording goals-of-care discussions and preserving them in EMRs may also be an interesting paradigm worth exploring in future studies.

## Models of ICU Care

In the past two decades, ICUs have increasingly played a relevant role in treating severe complications related to cancer and its therapy.<sup>34</sup> Evidence supporting dedicated intensivist

staffing in ICUs exists.<sup>35</sup> Despite clinical and economic benefits, medical staff politics and a shortage of intensivists impede the intensivist model.<sup>35</sup> Currently, different ICU models of care exist, such as open, closed, and collaborative models, as well as the electronic telemedicine ICU model. We must further investigate how these models of ICU care influence teamwork and team cognition.

## Interventions to Improve Team Cognition

There are multiple possibilities for interventions that could promote team cognition in HCT teams. Potential interventions are as follows:

The role of pretreatment team-based communication in an HCT clinic before the onset of a critical illness may have the potential to improve care (provider and patient satisfaction and morale) and reduce ICU admissions for those with poor prognosis. This early communication allows members of the HCT team to begin sharing information, which helps develop a shared understanding of the team's overall goals from the onset.

The impact of daily team conferences in the ICU with the families of patients who have undergone HCT may improve satisfaction and outcomes of care. It is likely that the effectiveness of such an intervention would be measured by patient- or family-reported outcomes such as satisfaction with care, quality of life, and stress and anxiety, as well as provider outcomes such as burnout, morale, and workload.

Cross-training among different health-care providers in simulated environments, using case-based approaches, can be hypothesized to improve teamwork and team cognition. Similar approaches have been used within other research settings, such as interactions between humans and computers.<sup>36</sup>

Although we think that these interventions and our overall recommendations to promote team cognition are necessary, we also acknowledge that there are costs associated with them. Nevertheless, we think these recommendations represent long-term financial benefits. The use of a team cognition approach has strong potential to positively affect quality of care and lower health-care expenditures by reducing "over utilization." Also, this approach has potential to positively affect both patient-reported outcomes and patient experiences. Because of these two factors, it is possible that payers, including the Centers for Medicare & Medicaid Services (especially in the context of Affordable Care Act), will look

favorably on appropriate reimbursement for the care pathways that use a team cognition approach.

Care of a medically complicated, heavily pretreated patient with cancer is fraught with team cognition challenges leading to incongruent messaging to the patient and family. There is a need to help facilitate team cognition in health-care teams. Once such a framework and interventions are developed, they could be extended to the care of complex patients in all settings, including academic, community, and even non-ICU settings. We hypothesize that enhanced team communication and facilitation of team cognition of the medical and social issues at all stages (before and during critical illness) will lead to improved cancer care delivery. **JOP**

## Acknowledgment

The production of this manuscript was funded by the Conquer Cancer Foundation Mission Endowment. Written on behalf of the Mayo Clinic-ASU Team Science Research Group. The case described in this manuscript is fictitious and is based on multiple different experiences shared by the authors. We thank the American Society of Clinical Oncology (ASCO) and the National Cancer Institute for their continued support during the conceptualization of this article. In addition, we thank Saliha Akca-Hobbins for her help on the article.

## Authors' Disclosures of Potential Conflicts of Interest

Disclosures provided by the authors are available with this article at [jop.ascopubs.org](http://jop.ascopubs.org).

## Author Contributions

**Conception and design:** All authors

**Collection and assembly of data:** All authors

**Data analysis and interpretation:** All authors

**Manuscript writing:** All authors

**Final approval of manuscript:** All authors

**Accountable for all aspects of the work:** All authors

Corresponding author: Ayan Sen, MD, MSc, Department of Critical Care Medicine, Mayo Clinic College of Medicine, Mayo Clinic Arizona, Phoenix, AZ 85054; e-mail: [sen.ayan@mayo.edu](mailto:sen.ayan@mayo.edu).

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**AUTHORS DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST****Team Cognition As a Means to Improve Care Delivery in Critically Ill Patients With Cancer After Hematopoietic Cell Transplantation**

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**Nathan J McNeese**

No relationship to disclose

**Nandita Khera**

No relationship to disclose

**Sara E Wordingham**

No relationship to disclose

**Noel Arring**

No relationship to disclose

**Sharon Nyquist**

No relationship to disclose

**Amy Gentry**

No relationship to disclose

**Brian Tomlinson**

No relationship to disclose

**Nancy J Cooke**

No relationship to disclose

**Ayan Sen**

No relationship to disclose