An Interprofessional Initiative to Address Tests Pending at Discharge for Hospitalized Pediatric Patients

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ABSTRACT

Introduction: Pediatric hospitalized patients often are discharged before all lab tests are completed. Given the risk of medical errors related to inadequate test follow-up, we piloted a collaborative initiative to address tests pending at discharge (TPAD) within our pediatric hospital medicine section. Our objectives were to delineate the responsibilities of case managers and pediatric hospital medicine clinicians in addressing these tests and to establish a communication process.

Methods: We formed an interprofessional team and performed a current state assessment, including a survey to pediatric hospital medicine clinicians to assess time spent following up TPAD and confidence that results were followed up in a timely and appropriate manner. We obtained a list of 1450 individual TPAD for the previous 9 months using an electronic health record data query, from which a list of 26 common and straightforward labs were identified for case manager follow-up. A shared case manager Epic Inbasket for TPAD was created and was checked twice daily. We developed a phased approach to establish a workflow for follow-up.

Discussion: The case manager partnership was launched in 4 phases for the duration of the 6-month pilot. However, due to duplication of work and less value of case managers addressing straightforward labs, the pilot was stopped. A more effective and mutually beneficial role for pediatric hospital medicine attendings and case managers may be to have the case managers address complex TPAD and communicate with primary care clinicians and families.

INTRODUCTION

Pediatric hospitalized patients often are discharged before all laboratory tests obtained during the hospitalization are completed. Although the percentage of pediatric patients with results pending at discharge is not published, it is estimated that up to 41% of adult hospitalized patients have tests pending at discharge (TPAD) and that almost half of these patients experience medical errors

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related to inadequate follow-up of these tests.[1-3] Successful follow-up of TPAD is a multistep process, including, but not limited to, identification and documentation of the tests, notification of person responsible for follow-up, and recognition and execution of the appropriate follow-up actions. A failure in any of these steps can result in inadequate follow-up. This leads to suboptimal care for patients with incomplete transitions of care from inpatient to outpatient clinicians. Poor management of TPAD can lead to duplication of efforts, delay of care, patient dissatisfaction, adverse events, and even litigation.[3-6]

A body of adult-based literature focuses on the issues around TPAD, from the discrepancies in how physicians perceive the actionability of the these test results to systematic reviews of interventions to improve TPAD follow-up.[7-10] In today's health care environment, patient care is intertwined with the electronic health record (EHR). Not surprisingly, multiple efforts have, therefore, focused on implementation of EHR-based tools, including automated result notifications and prompts within the discharge summary to enforce documentation of tests with pending results.[1,7,8,10-16] Other technological solutions have been utilized as well, such as automated email notification systems embedded within the health system's integrated clinical information systems.[11-13,17] Systematic reviews of the various interventions found that individual education and tools, such as health information technology-based tools, can improve awareness of TPAD, but solutions must be multifaceted.[7,8,10]

The same potential safety risks of TPAD exist in the hospitalized pediatric population, with the added complexity of commu-

nication to caregivers, as well as patients, to provide continued patient- and family-centered care. Similar to adult hospital medicine, there is no best practice for how to most effectively handle TPAD in pediatric hospital medicine (PHM). Follow-up and notification of families and outpatient clinicians of certain results (ie, negative or normal results) are within nursing scope of practice and would not need to be completed by the discharging clinician. As hospitalists at an academic institution who work in 1-week clinical blocks and are heavily involved in other academic efforts, we potentially may not access the EHR for several weeks in between clinical activities, unless we are intentionally waiting for specific lab results. For this reason, there was concern for clinician variability in addressing TPAD. Additionally, depending on the nature of the result, TPAD follow-up can also be time-intensive, and we proposed it may be done more efficiently through a collaboration with other health care team professionals.

At our institution, nurse case managers have been champions of safe discharge and transitions of care to home. Thus, we proposed an expansion of the case manager role to address labs that are completed after discharge and to help direct communication with primary care clinicians and families. Our objectives were to establish a process for (1) defining which test results case managers would follow up, (2) establishing case manager workflow for addressing TPAD, and (3) communicating between case managers and the discharging clinician.

METHODS

We performed this work at a freestanding tertiary care pediatric hospital with 306 beds, 16 321 admissions per year, and an average daily census of 208 patients. Our PHM service has an average daily census of 36, and PHM attendings are clinically active for 7 consecutive days. We have 30 PHM attendings with 19 clinical full-time equivalents and 9 advanced practice providers. We have attending coverage 24 hours a day, 7 days a week, with a nocturnist present every night. Our case manager group has 34 members and 25 full-time equivalents that support all inpatient teams during weekdays with in-hospital coverage from 6 AM to 11 PM. Our hospital EHR is Epic (Epic Systems Corporation, Verona, Wisconsin).

We formed an interprofessional team, called the Discharge

Box. Tests Pending at Discharge Included in the Pilot Project

Blood Culture	Adenovirus NAAT
Cerebrospinal fluid smear and culture	Enterovirus and parechovirus NAAT
Fungal culture	*Neisseria gonorrhoeae* DNA
Anaerobic/aerobic bacterial smear and culture	*Chlamydia trachomatis* DNA
Mycobacterium smear and culture	*Bartonella* Ab IgG and IgM with reflex titer
Respiratory syncytial virus NAAT	Cytomegalovirus IgG and IgM
Influenza A and B NAAT	Basic metabolic panel
Human metapneumovirus NAAT	Comprehensive metabolic panel
Rhinovirus NAAT	Complete blood cell count
Parainfluenza NAAT	Complete blood cell count with differential
Coronavirus NAAT	Cerebrospinal fluid profile

Abbreviation: NAAT, nucleic acid amplification test.

Table. Details of Phased Approach with Progressive Levels of Responsibility for Case Managers

Phase	Duration	Description	Purpose
1	11/19/18 – 1/1/19	CM and PHM attending receive negative/normal results for labs included in the pilot (Box) in shared InBasket. CMs write result note	Introduce CM to process of checking InBasket, documenting results in Epic
2	1/2/19 – 2/24/19	CMs receive negative/normal results. PHM attendings no longer receive negative/normal results	Remove results from PHM attendings InBaskets since CMs able to check results and document result note
3	2/25/19 – 4/21/19	CMs receive positive/abnormal results. PHM attendings continue to see positive/abnormal results.	Identify processes needed for CMs to triage positive/abnormal result
4	4/22/19 – 5/28/19	CMs receive positive/abnormal results. PHM attendings no longer receive positive/abnormal results.	CMs able to address both negative/normal results and positive/abnormal results

Abbreviations: CM, case managers; PHM, pediatric hospital medicine.

Follow-up Workgroup, consisting of hospitalists, acute care nursing leadership, information technology support, data analysts, and case managers. First, the team confirmed the preexisting process for communicating TPAD results. This process included automatic routing to the primary care clinician the following information after discharge: (1) discharge event notice with components of the patients' after visit summary, (2) discharge summary, (3) labs results completed after discharge. Primary care clinicians could choose fax or Epic InBasket as their preferred communication. Additionally, the discharging hospitalist also was routed test results finalized after discharge to their Epic InBasket.

During the information gathering phase of the project, we queried two pediatric hospital medicine listservs (pediatric hospital medicine division directors and pediatric hospital medicine Listserv) regarding TPAD practices. These resulted in responses from two institutions. One institution reported utilizing advanced practice providers for TPAD; the other stated that individual clinicians follow up on TPAD, similar to our institution's practice.

To assess the preexisting hospitalist workflow (prior to our PHM/case manager partnership), we surveyed the PHM attendings to assess the following: time spent after a service week fol-

lowing up TPAD (<30 minutes, 30-59 minutes, 1-2 hours, >2 hours) and confidence (using a 1-5 Likert scale) that TPAD from patients they care for were followed up in a "timely and appropriate manner."

We obtained a list of TPAD during the 9 months prior to our start date using a data query within our EHR (See Box). We selected laboratory results for case managers to manage based on frequency and feasibility (ie, those with a binary result), with the plan for expansion into more complex labs and responsibility over time. We sought to evaluate the time lapse between test completion and time reviewed but were unable to consistently determine when a result was reviewed by a clinician due to limitations within our EHR.

A shared case manager Epic Inbasket for TPAD for PHM patients was created. We developed a phased approach with progressive levels of responsibility and autonomy for case managers (Table) to establish a workflow for TPAD follow-up, documentation, and communication between case managers and PHM clinicians. We communicated with the PHM faculty prior to the beginning of each phase to reinforce the new changes. Throughout these phases, we tracked the time spent on TPAD follow-up by case managers, had regular team meetings with our core group, and had intermittent discussion and feedback sessions with the PHM faculty. The case managers were provided with information on changes to the workflow as we progressed through the phases. If they had any questions about how to address a particular result, they would email the core Discharge Follow-up Workgroup team for guidance, and we would use those examples for education and process development if needed.

The shared Epic Inbasket was checked by case managers twice daily, initially 5 days per week, increasing to 7 days per week by phase 3. They would review the result and write a brief note—regardless of whether the result was positive/abnormal or negative/normal—with the following as an example: "Lab result is normal/negative. Reviewed by CM (case manager)." A "tip sheet" was created for the case managers to use as a guide to review and document the result. If the result was positive, the case manager also would contact the discharging clinician via page or an email message, depending on the result. Email was used instead of the Epic messaging functionality based on feedback that PHM faculty did not check their Epic InBaskets regularly if they were not clinically active. One of the Discharge Follow-up Workgroup PHM attendings was always on call for the case managers if they were unable to contact the discharging clinician or had any urgent questions.
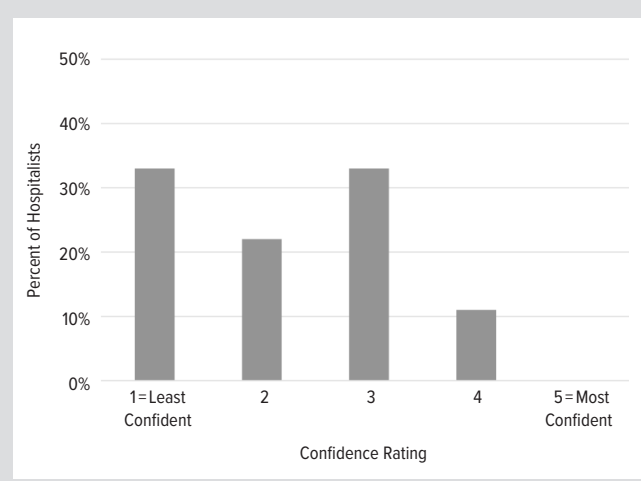
RESULTS
PHM Faculty Survey Results
Fourteen out of 30 PHM faculty responded to the survey question assessing time spent following up TPAD, on average, after a service week. Fourteen percent (2/14) of respondents spent less than

Figure 1. Hospitalists' Time Spent After Clinical Service Week Addressing Tests Pending at Discharge, N=14
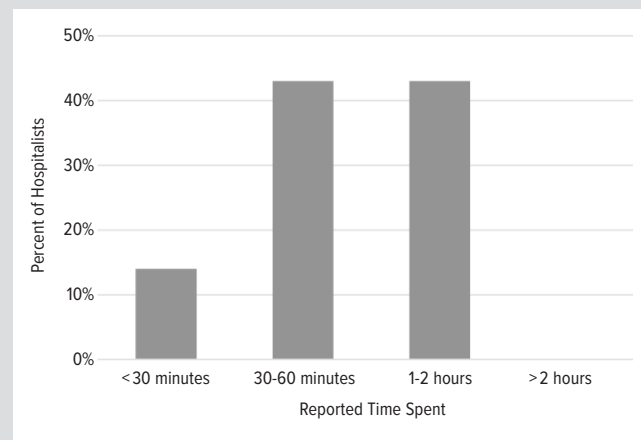
Figure 2. Hospitalists' Confidence Tests Pending at Discharge Were Being Appropriately Addressed, N=9

30 minutes, 43% (6/14) spent 1 to 2 hours, and 43% (6/14) spent more than 2 hours (Figure 1). Nine PHM faculty responded to the survey regarding confidence that TPAD were being addressed in a "timely and appropriate manner." See Figure 2 for results.

TPAD Inclusion
Review of all TPAD over the 9 months prior to our start date resulted in 1450 individual tests. From these individual tests, we performed a frequency analysis; 22 initial laboratory results were identified as feasible for case managers to manage based upon the following: (1) binary nature of result and lack of ambiguity if positive or negative, and (2) nonurgent results (ie, a positive result would not have clinical impact if not seen for 24 hours). The laboratory values that required knowledge of the patients' clinical course or discussion with subspecialists or primary care clinicians remained the primary responsibility of the PHM clinicians. Originally, we planned to expand the scope of laboratory results covered by case managers to include more complex results;

however, this did not occur due to the discontinuation of the pilot work.

Establishing Workflow for Addressing TPAD

The PHM/case manager partnership was launched in phases, with each phase being 1 to 2 months, for the duration of the pilot, which lasted approximately 6 months (193 days). The case manager responsibilities and autonomy increased with the progression of phases. Thirteen case managers were trained on the process of checking the labs during this partnership, with 5 primary case managers reviewing the labs. Case managers checked the InBasket twice daily. Overall, there were 1102 results that generated a total of 1567 InBasket messages. (Some labs, such as culture results, are updated daily until final, resulting in multiple messages per lab result.) An average of 8.1 results were addressed per day. The time spent per day was 20 to 30 minutes, which included documentation and notifying the attending physician via email.

Communication Between Case Managers and the Discharging Clinician

A detailed protocol was developed for the case managers to address positive/abnormal results (Appendix 1). During our interprofessional monthly check-in meetings, case managers reported that the majority of TPAD were already addressed by PHM clinicians prior to them viewing the results. Informal feedback from our PHM attendings was also consistent with the case manager feedback – most of the time, the PHM attendings had seen the results before the case managers addressed them.

DISCUSSION

A process for case managers to address TPAD from patients discharged from the PHM service was established. We achieved our objectives of defining laboratory results for case managers to follow up and establishing a workflow for them to address those tests and communicate with the discharging clinician. However, during our work to establish a process for TPAD follow-up, we realized it lacked efficiency and was not sustainable, so we discontinued the pilot after 6 months. The major barriers we encountered included duplication of work between case managers and PHM attendings, no perceived benefit to PHM attendings in shifting TPAD follow-up responsibilities to case managers, and lack of ability to expand addressing TPAD due to case managers' bandwidth. Despite discontinuing the pilot, we learned several lessons that may be of use to other hospital medicine groups seeking to implement a similar process around timely TPAD follow-up.

Despite involvement of the case managers, PHM attendings continued to frequently check lab results, leading to duplication of efforts. At our institution, PHM attendings work a 7-day clinical service week, and attendings were often still on clinical service when the results of the TPAD were returned on their dis-

charged patients. As a result of their frequent interface with the EHR throughout the day, they often viewed the results before case managers since the case manager InBasket was checked only twice daily. Even in phase 4 when TPAD results were not coming to their Epic InBaskets, many PHM attendings still followed TPAD results through EMR patient lists. Thus, there was duplication of work between the case managers and PHM attendings as both groups often were following up on results simultaneously. After the pilot ended, debriefing with the hospitalist group revealed that many hospitalists continued to feel obligated to follow all TPAD despite case manager involvement—especially since many complex labs remained the responsibility of the PHM attending.

As mentioned, part of our work included a survey to our faculty assessing time spent following up TPAD results after clinical service weeks and whether they were confident that TPAD were being addressed in a timely and appropriate manner. We had a low response rate to both questions, as less than 50% of the faculty completed the survey, which we assumed was due to survey fatigue. However, it is possible that some faculty did not feel process improvement was needed in this area, for various reasons. Retrospectively, we could have considered including a direct question of whether faculty thought we should work to improve the current TPAD follow-up process or had an open discussion with the faculty prior to starting the project.

By design, the TPAD included in the pilot also were noted to be easily addressed by PHM attendings. Therefore, having these tests addressed by case managers did not lead to a significant efficiency benefit for the clinicians. Planned next steps included having case managers follow up more complex TPAD, such as those that may require primary care clinician or subspecialist discussion. However, due to other competing responsibilities and with seasonal fluctuations in hospital census, the case managers could not commit to taking on a larger role to address TPAD. Since there was lack of benefit to the PHM attendings and low likelihood of expanding the case manager role, our interprofessional team decided to discontinue the pilot and return to the previous workflow of having the PHM attendings follow up on the TPAD.

Although our PHM/case manager partnership for following up TPAD was discontinued, the work was still beneficial for both groups. As we prepared for the partnership, PHM attendings had the opportunity to reflect on existing processes for handling lab results, raising awareness of the importance of TPAD responsibility. This may have led some attendings to be more diligent regarding responsibility for TPAD. We also identified a gap of clinician coverage during vacation or family or medical leave, and our section developed an internal process to cover our partners during these times. The case managers working with our interprofessional teams developed an even more intimate understanding of the problems associated with TPAD. We believe they can use the knowledge developed during our work to enhance discharge plan-

ning by working with the care team to delegate TPAD responsibility prior to discharge.

We believe the description and dissemination of our work will benefit other PHM sections who face similar issues with TPAD. At our institution, given their regular daily full caseload, case managers did not appear to be the correct fit for assisting with TPAD. Regardless of who assumes responsibility for these tests, they need the appropriate time and resources to become fully accountable for the process, and delegation should take into consideration current workloads. Smaller teams or groups with fewer TPAD still may be able to successfully incorporate case managers into the TPAD process. However, in our group, a team of 30 PHM attendings and 5 core case managers may have been too large to develop appropriate trust to allow for the most efficient processes. Without such trust, changing physicians' personal preferences and habits for following TPAD can be difficult.

Other PHM sections also may benefit from our efforts involving our EHR. The process we built could be replicated and implemented by other institutions that use Epic, as routing and Epic InBaskets are available within standard Epic operating systems.

As PHM attendings, we still believe there is a gap in how TPAD are addressed and remain concerned about related safety issues. Future interventions to address this gap could include a dedicated PHM registered nurse with the primary responsibility of addressing TPAD and communicating with specialists, primary care clinicians, and families. Ideally, this role would be integrated into our team and would receive additional training on specific and complex TPAD and how to communicate with specialists and primary care clinicians. With a more dedicated role, it would be easier to build trust between PHM attendings and the TPAD follow-up specialist, allowing for follow-up of both simple and more complex TPAD.

CONCLUSIONS

Overall, after performing this work, our conclusions regarding TPAD are similar to the ideas and concerns we had at the beginning of our pilot: TPAD pose a significant safety issue to our patients, there is variability in how they are addressed, and there does not seem to be a simple solution or one-size-fits-all approach to address them. We also acknowledge that the 21st Century Cures Act,[18] implemented nationally in 2021, adds additional complexity to TPAD. As a result of this legislation, an increasing number of patients and families have access to their electronic health records and test results, and families may have questions about the results without an easily accessible care clinician. Thus, it is essential that clinicians communicate with patients and families about the results of TPAD.

Future solutions for addressing TPAD need to be efficient in maximizing the scope of involved team members, systematic, inclusive of all TPAD to ensure safe follow-up, and trusted by all members of the team.

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