

## INNOVATION AND IMPROVEMENT

### *Innovations in Medical Education*

# Toward Safe Hospital Discharge: A Transitions in Care Curriculum for Medical Students

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**BACKGROUND:** Medical errors often occur when patients move between care settings. Physicians generally receive little formal education on improving patient care transitions.

**OBJECTIVE:** To develop a sustainable and effective Transition in Care Curriculum (TICC). Specific goals were to increase student confidence in and knowledge of skills necessary during care transitions at the time of hospital discharge, and to quantify the frequency of student-identified medication discrepancies during a post-discharge home visit.

**DESIGN:** TICC was delivered to 136 3rd-year medical students during their required inpatient medicine clerkship at six urban Denver hospitals. TICC consists of small and large group interactive sessions and self-directed learning exercises to provide foundational knowledge of care transitions. Experiential learning occurs through direct patient care at the time of discharge and during a follow-up home, hospice, or skilled nursing visit. Students completed a pre-post confidence measure, short answer and multiple choice questions, a post-clerkship satisfaction survey, and a standardized medication discrepancy tool.

**MAIN RESULTS:** Overall combined confidence in transitional care skills improved following the TICC from an average score of 2.7 (SD 0.9) to 4.0 (SD 0.8) ( $p < 0.01$ ) on a 5-point confidence scale. They scored an average of 77% on the written discharge plan portion of the final exam. Students rated the usefulness of TICC at a mean of 3.1 (SD 0.7), above the combined mean of 2.7 for project work in all required clerkships. Students identified medication discrepancies during 43% of post-discharge visits (58 of 136). The most common reasons for discrepancies were patient lack of understanding of instructions and intentional non-adherence to medication plan.

**CONCLUSION:** TICC represents a feasible and effective program to teach evidence-based transitional care.

**KEY WORDS:** care transitions; curriculum development/evaluation; home visit; undergraduate medical education; hospital discharge.

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## INTRODUCTION

Transitional care has been defined as “a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different sites or levels of care.”<sup>1,2</sup> Discharge following hospitalization presents a particularly important care transition. Up to 49% of patients will experience a discharge-related medical error or adverse event during care transitions<sup>3–9</sup>. Elders and patients with complex care needs are especially at risk<sup>2</sup>.

The Joint Commission, American Geriatric Society, Accreditation Council on Graduate Medical Education (ACGME), and Liaison Committee on Medical Education (LCME) have all identified care transitions as a core element of patient care and a critical component of health professional education<sup>1,10,11</sup>. However, only 16% of Internal Medicine residency programs have formal discharge curricula<sup>12</sup>.

Published medical student curricula for hospital discharge care transitions are limited to Ouchida's Fast Forward Rounds and Lai's interdisciplinary home visit intervention<sup>13,14</sup>. Ouchida published a workshop and lecture-based curriculum that is well received by students. However, this curriculum does not include an experiential component and is relatively time-intensive for faculty. Lai described an interdisciplinary post-discharge home visit curriculum that paired medical students with pharmacy students. They found improved student attitudes and self-assessed skills in interdisciplinary collaboration and transitional care for chronically ill patients. Although these curricula add substantially to the existing literature, they lack substantive outcome assessments.

In this paper, we describe a comprehensive Transition in Care Curriculum (TICC) for 3rd-year medical students that incorporates core elements of published curricula and aspects of an evidence-based intervention shown to reduce adverse events during care transitions<sup>15</sup>. We assess the impact of this curriculum on students' confidence, knowledge, and satisfaction, and investigate the frequency with which students participating in this curriculum identify medication discrepancies.

## AIM

TICC was developed to educate 3rd year medical students about the risks associated with care transitions and specific strategies to reduce these risks. We implemented this curriculum in the 3rd year of medical school hoping to facilitate excellent care transition and discharge planning behaviors early in clinical training.

## SETTING

One hundred thirty-six 3rd year medical students at the University of Colorado School of Medicine received the TICC during their required 8-week inpatient internal medicine clerkship in 2007–2008.

## PROGRAM DESCRIPTION

TICC uses multiple instructional modalities, including didactics, self-study, experiential learning, and small group discussion to appeal to a variety of different learning styles<sup>16</sup>. Didactics: Introductory didactics provide students with foundational knowledge regarding the risks of care transitions and specific interventions shown to reduce these risks<sup>15,17–19</sup>. We chose to emphasize the model described by Coleman, which focuses on four key elements of successful care transitions: (1) medication self-management and reconciliation, (2) patient activation for self-care, (3) timely follow-up, and (4) a list of “red flags” and what to do should they occur. When combined with advanced practice nursing home visits, studies found that interventions using this model decreased peri-discharge events and overall costs, while increasing patient satisfaction and quality of life<sup>15,17</sup>. Following this didactic session, two faculty members role-play an ideal peri-discharge meeting between a patient and student including how to educate the patient about their disease, medications, worrisome symptoms, and follow-up care. The experiential, self-study, and small-group curriculum components are described including responsibilities, safety, and professionalism<sup>20</sup>.

Self-Study: To encourage evidence-based practice, students receive, “The Care Transitions Intervention: Results of a Randomized Controlled Trial”<sup>15</sup> and are directed to a website, <http://www.caretransitions.org/index.asp>, which contains materials intended to improve the quality and safety of care transitions.

Experiential: Students, with the assistance of their inpatient team, prepare discharge plans using Coleman’s framework. They conduct peri-discharge meetings with patients or proxies and communicate with the primary care provider (PCP) regarding the hospital course and follow-up. Students choose one patient to visit at home, hospice, or skilled-nursing facility within 2 weeks of discharge. Patients are chosen based on characteristics that place them at high risk of a post-discharge complication<sup>15</sup>. During this post-discharge visit, students review follow-up instructions and perform medication reconciliation using the standardized Medication Discrepancy Tool© (MDT)<sup>21</sup>. Because students are not allowed to make independent medical decisions, they are instructed to communicate with the inpatient medical team or PCP to resolve any discrepancies or patient concerns.

Small Group: Groups of six to eight students review the assigned article, discuss clerkship experiences, and share lessons learned through the post-discharge visits (materials available at <http://www.pogoe.org/productid/20518>, an online repository of geriatric educational materials)<sup>20</sup>.

There were several challenges to implementation of this curriculum. Site directors were initially concerned that community PCPs would not accept students performing home visits on their patients. However, PCPs have been uniformly welcoming of the supplemental patient information and enhanced communication between inpatient and outpatient care providers. Concerns regarding malpractice coverage, liability, and student safety were also raised. Discussion with risk management services at our institution revealed university liability insurance coverage extends to the home visit as a component of the required clinical curriculum. To address concerns about student safety, inpatient attendings help students choose an appropriate patient for follow-up; students are encouraged to do visits in pairs, inform a team member of their plans, and carry a cellular phone with key contact numbers.

## PROGRAM EVALUATION

We evaluated TICC in three student domains: confidence, knowledge, and satisfaction. In addition, we assessed the frequency with which students identified medication discrepancies. Confidence was evaluated through questionnaires completed by students prior to and immediately after the clerkship. The questionnaire assessed student confidence in their ability to perform key components of successful care transitions using an anchored 5-point scale (1 = not at all confident; 5 = very confident) (Table 1). Overall confidence was assessed by combining all elements of the questionnaire and averaging them to obtain a single confidence score.

To assess knowledge acquisition and the ability to create a written discharge plan, a multi-part, case-based, short-answer question was incorporated into the clerkship final exam. It was graded using a standardized rubric by a single rater (rubric available at [www.pogoe.org](http://www.pogoe.org))<sup>20</sup>. Two multiple choice questions measured knowledge of common pitfalls in transitional care. The examination and individual questions are reviewed continually using difficulty and discrimination indexes, KR-20 reliabilities, means and standard deviations. In addition, independent reviewers assess the validity and relevance of the exam questions on an annual basis.

Student satisfaction with the curriculum was assessed with a single question (How useful was the transitions in care project for your learning?) during the end of clerkship evaluation using a 5-point scale (1 = not at all useful; 5 = very useful).

The frequency of student-identified medication discrepancies was measured using the required MDT completed during the students’ post-discharge visit. Students noted whether the discharge medication list reconciled with home medications including dosing, deletions, additions, and unexpected over-the-counter pharmaceuticals. Frequency of discrepancies was calculated as the percent of total MDTs with identified discrepancies.

Table 1. Student Confidence on the Pre- and Post-Survey

Question: How confident are you in your ability to:	Pre-test mean (SD) N=115	Post-test mean (SD) N=98	p value
Complete a medication reconciliation with a patient?	2.6 (1.05)	4.4 (0.68)	<0.01
Identify important barriers a patient faces when transitioning from the acute inpatient setting to the outpatient setting?	2.7 (0.77)	4.1 (0.64)	<0.01
Develop an appropriate follow-up plan for a patient on hospital discharge?	2.6 (0.95)	4.1 (0.66)	<0.01
Complete an evaluation of a patient's safety at home?	2.6 (0.73)	3.6 (0.90)	<0.01
Complete an evaluation of a patient's functional abilities at home?	2.8 (0.92)	3.6 (0.89)	<0.01
Adequately communicate with a patient's follow-up provider about the important issues managed in the inpatient stay?	3.0 (0.82)	4.4 (0.67)	<0.01
Adequately communicate with a patient's follow-up provider about the important issues requiring follow-up after hospital discharge?	2.9 (0.83)	4.3 (0.73)	<0.01
Identify the appropriate discharge setting for a patient?	2.5 (0.85)	3.8 (0.71)	<0.01
Total mean confidence	2.7 (0.89)	4.0 (0.80)	<0.01

Five-point scale where 1 = not at all confident and 5 = very confident  
 Number surveys: pre = 115 and post = 98  
 Mean score reported

## Statistics

Since the surveys were anonymous, comparisons between pre- and post-confidence responses were performed at the group level. Associations between these groups were tested separately for each question using Cochran-Mantel-Haenszel tests that treated confidence scores as ordinal variables.

## Results

One hundred thirty-six students participated in TICC, and 98 provided post-TICC confidence ratings. Overall confidence scores increased from an average of 2.7 (SD 1.0) prior to TICC to 4.0 (SD 0.8) after TICC ( $p < 0.01$ ) (Table 1). Evaluation of patient home safety and functional abilities at home were not explicitly discussed in the curriculum and were included in the confidence measure as an internal control. Students showed similar pre-test confidence levels regardless of whether the curriculum was completed at the beginning or the end of the academic year (data not shown).

Students achieved a mean score of 77% on the short answer question. On the multiple choice questions, 97% of students chose the correct definition of medication reconciliation, and 81% identified a bedrest order as detrimental for a patient transferred to a nursing home. The overall mean for the

complete written examination has been stable at 62–64% over several years.

Students rated the usefulness of TICC at a mean of 3.1 (SD 0.7), which was above the combined mean of 2.7 for project work in all required clerkships and among the highest rated of all projects within the clinical core. Eighty-two percent of students rated the curriculum as somewhat, mostly, or very useful. Comments varied widely. One student noted, "Transitions in care was probably the most useful. Even though it was a lot of work and uncomfortable for some people, I think that it is a useful and important part of hospitalized patient care." However, not all were favorable; another student said, "I find that the worst thing about these rotations is all the extra stuff that gets added in to do. This is supposed to be about learning patient and disease management. When you add in extra projects it dilutes the time I have to study."

Students identified medication discrepancies during 43% (58/136) of post-discharge visits. Intentional non-adherence and inadequate understanding of medication directions were the most common associated factors.

## DISCUSSION

TICC combines successful elements of previously published curricula with an evidence-based introduction to elements of successful care transitions using a multimodal curriculum. Students completing TICC demonstrated increased confidence in their care transitional skills and high end-of-course knowledge of key elements of discharge planning.

Our study affirms the findings of Ouchida and Lai suggesting that transitional care curricula are associated with increased student confidence in discharge planning<sup>13,14</sup>. This effect does not seem to be attributable to the amount of prior clinical experience as pre-test confidence levels were similar for students at the beginning and the end of their 3rd year. Students scored higher on both the short answer and the multiple choice questions relevant to care transitions than the overall test mean of 62–64%, suggesting that students have attained expected knowledge in this area. We cannot, however, directly attribute this knowledge to the curriculum since we did not perform a pre- and post-assessment or use a control group.

Students participating in TICC identified medication discrepancies in 43% of post-discharge home visits. This is significantly more than the 14% identified by advanced practice nurses in the Care Transitions Intervention but less than the 63% that others have predicted<sup>3,7,15,21</sup>. In TICC, patients were selected for post-discharge visits because they were at high risk of complications including medication confusion. This likely explains at least some of the increase in medication reconciliation errors as compared to the Care Transitions Intervention. Our study did not assess whether the finding of these medication discrepancies actually resulted in reduced re-hospitalization or adverse events; however, these preliminary results suggest that such a study would be valuable.

Most students found the curriculum useful for their education. However, project work that takes students out of their daily clerkship activities is consistently rated poorly at our

institution, and comments revealed that some students feel TICC takes away from the "real" work of the hospital. Clerkship directors need to be responsive to this concern, reiterate the importance of the project to students' overall understanding of patient care, and provide reassurance that this time away will not impact evaluations from their inpatient teams. Including the information in the final exam has reinforced its importance. Since the initial implementation, we made several minor changes based on student feedback. Students now perform follow-up phone calls to all patients they care for within 48 h of discharge. This provides real-time feedback to the student and team regarding their discharge planning and allows students to target post-discharge visits to patients at greatest risk of complication. All students receive a pocket card that provides important information about the various sites of care available on discharge from the hospital and the services they provide. Preliminary data suggest that these changes improved student satisfaction.

The most significant limitation to the TICC evaluation stems from our inability to determine whether the gains in student confidence are sustainable and will result in improvement in the skills necessary to perform an effective care transition. We are currently assessing the impact of this curriculum on student ability to effectively discharge a standardized patient. The impact of such a curriculum on actual patient care outcomes will require a large multi-site intervention. Other limitations include the non-validated confidence scale and exam questions and unclear generalizability given that the study was performed on a single class of students at one institution.

TICC is one potential model for incorporating the important topic of care transitions into the required medical student curriculum. We encourage other medical schools to implement similar programs.

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## REFERENCES

1. Coleman EA, Boulton C. Improving the quality of transitional care for persons with complex care needs. *J Am Geriatr Soc.* 2003;51:556-7.
2. Coleman EA. Falling through the cracks: challenges and opportunities for improving transitional care for persons with continuous complex care needs. *J Am Geriatr Soc.* 2003;51:549-55.
3. Forster AJ, Murff HJ, Peterson JF, et al. Adverse drug events occurring following hospital discharge. *J Gen Intern Med.* 2005;20:317-23.
4. Beers MH, Sliwowski J, Brooks J. Compliance with medication orders among the elderly after hospital discharge. *Hosp Formul.* 1992;27:720-724.
5. Forster AJ, Clark HD, Menard A, et al. Adverse events among medical patients after discharge from hospital. *CMAJ.* 2004;170:345-9.
6. Kripalani S, LeFevre F, Phillips C, et al. Deficits in communication and information transfer between hospital-based and primary-care physicians: implications for patient safety and continuity of care. *JAMA.* 2007; 297(8):831-41.
7. Coleman EA, Smith JD, Raha D, Min SJ. Post-hospital medication discrepancies: prevalence, types and contributing factors. *Arch of Intern Med.* 2005;165(16):1842-7.
8. Moore C, Wisnivesky J, Williams S, McGinn T. Medical errors related to discontinuity of care from an inpatient to an outpatient setting. *J Gen Intern Med.* 2003;18:646-51.
9. Forester AJ, Murff H, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med.* 2003;138:161-7.
10. Joint commission 2009 national patient safety goals hospital program. <http://www.jointcommission.org/patientsafety/nationalpatientsafetygoals/>. Accessed April 5, 2010.
11. Green ML, Aagaard EM, Caverzagie KJ, Chick DA, Holmboe E, Kane G, Smith CD, Iobst W. Charting the road to competence: developmental milestones for internal medicine residency training. *J Grad Med Educ.* 2009;1(1):5-20.
12. Aiyer M, Kukreja S, Ibrahim-Ali W. Discharge planning curricula in internal medicine residency programs: a national survey. *South Med J.* 2009;102(8):795-9.
13. Ouchida K, LoFaso VM, Capello CF, Ramsaroop S, Reid MC. Fast forward rounds: an effective method for teaching medical students to transition patients safely across care settings. *J Am Geriatr Soc.* 2009;57:910-7.
14. Lai CJ, Nye HE, Bookwalter T, Kwan A, Hauer KE. Postdischarge follow-up visits for medical and pharmacy students on an inpatient medicine clerkship. *J Hosp Med.* 2008;3(1):20-7.
15. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med.* 2006;166:1822-8.
16. Newble DI, Entwistle NJ. Learning styles and approaches: implications for medical education. *Med Educ.* 1986;20:162-75.
17. Preen DB, Bailey BE, Wright A, et al. Effects of a multidisciplinary, post-discharge continuance of care intervention on quality of life, discharge satisfaction, and hospital length of stay: a randomized controlled trial. *Int J Qual Health Care.* 2005;17:43-51.
18. Naylor MD, Broton D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA.* 1999;281:613-20.
19. Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. *Arch Intern Med.* 1998;158:1067-72.
20. Bray-Hall ST, Aagaard EM. A transitions in care curriculum for medical students. <http://www.pogoe.org/productid/20518>. Accessed 4/5/2010.
21. Smith JD, Coleman EA, Min S. Identifying post-acute medication discrepancies in community dwelling older adults: a new tool. *Am J Geriatr Pharmacother.* 2004;2(2):141-8.