Redesigning the Clinical Learning Environment to Improve Interprofessional Care and Education: Multi-Method Program Evaluation of the iPACE Pilot Unit

Sarah Hallen, MD
Thomas Van der Kloot, MD
Christyna McCormack
Paul K. J. Han, MD, MPH
Frances L. Lucas, PhD
Lisbeth Wierda, MPH
Daniel Meyer, MD
Kalli Varaklis, MD, MSEd
Robert Bing-You, MD, MEd, MBA

ABSTRACT

Background In 2016, Maine Medical Center received an Accreditation Council for Graduate Medical Education Pursuing Excellence in Innovation grant to redesign the clinical learning environment to promote interprofessional care and education. The Interprofessional Partnership to Advance Care and Education (iPACE) model was developed and piloted on an adult inpatient medicine unit as an attempt achieve these aims.

Objective We describe the iPACE model and associated outcomes.

Methods Surveys and focus groups were employed as part of a multimethod pragmatic observational strategy. Team surveys included relational coordination (RC): a validated proprietary measure of interpersonal communication and relationships within teams. Pre-iPACE respondents were a representative historical sample from comparable inpatient medical units surveyed from March to April 2017. iPACE respondents were model participants surveyed March to August 2018 to allow for adequate sample size.

Results Surveys were administered to pre-iPACE (N = 113, response rate 74%) and iPACE (N = 32, 54%) teams. Summary RC scores were significantly higher for iPACE respondents (iPACE 4.26 [SD 0.37] vs 3.72 [SD 0.44], $P < .0001$), and these respondents were also more likely to report a professionally rewarding experience (iPACE 4.4 [SD 0.6] vs 3.5 [SD 1.0], $P < .0001$). Learners felt the model was successful in teaching interprofessional best practices but were concerned it may hinder physician role development. Patient experience was positive.

Conclusions This pilot may have a positive effect on team functioning and team member professional experience and patient experience. Learner acceptance may be improved by increasing autonomy and preserving traditional learning venues.

Introduction

The responsibility of graduate medical education (GME) is to prepare residents to meet the challenges of working in a rapidly evolving health care environment. The Accreditation Council for Graduate Medical Education (ACGME) Common Program Requirements mandate that "Residents must care for patients in an environment that maximizes communication [and] includes the opportunity to work as a member of effective interprofessional (IP) teams."[1]

Identifying methods to train high-functioning teams remains a challenge. While integration of IP care into traditional inpatient teaching services has been described as a "utopian" ideal,[2] practice-based interventions such as interdisciplinary rounds have not been shown to improve collaborative behavior, clinician well-being/burnout, clinical processes, care efficiency, or patient outcomes.[3–6]

The Interprofessional Partnership to Advance Care and Education (iPACE) model is an exploratory educational pilot attempting to meet this need. In 2016, Maine Medical Center (MMC) was awarded an ACGME Pursuing Excellence in Innovation grant to redesign the clinical learning environment (CLE) to promote IP care and education. MMC approached this project as a quality improvement (QI) project or "learning laboratory." The iPACE model is the result of an iterative design process that incorporated recommendations from the literature on how to optimize IP collaborative practice in health care.[7–12] Elements selected for inclusion from other published IP care models included geographic co-location of

DOI: http://dx.doi.org/10.4300/JGME-D-19-00675.1

Editor's Note: The online version of this article includes an example iPACE team weekday schedule, implementation survey demographics of Pre-iPACE and iPACE respondents, the survey used in the study, interview guides, and patient experience questionnaire.

clinicians and patients; structured, scheduled IP rounds; a physician–nurse leadership dyad that uses unit-level quality and safety data to inform care; and IP educational sessions to promote cross-discipline learning and collaboration efforts.[9,13–15] The iPACE model was further refined with input from a formal systems engineering analysis of MMC GME processes conducted by Northeastern University's Healthcare Systems Engineering Institute.

Many key elements of IP team care have been characterized in the literature, including shared goals, clear roles, mutual trust, effective communication, measurable processes and outcomes, and organizational support, but there is no single, universally accepted definition or measure of the construct of IP team care.[16,17] The evaluation plan of the iPACE pilot contained measures of team characteristics, including an adaptation of the Mini-Z (TABLE 1) to assess team well-being. It has been reported that such metrics may be more sensitive to IP interventions than traditional clinical outcome measures (ie, length of stay or readmission rates).[18,19] Identification of a tool to evaluate the construct of teaming was more difficult.

Relational coordination (RC), developed by Jody Hoffer Gittell, PhD, is a well-established theoretical framework and assessment strategy. RC states that the coordination necessary for ideal IP team care requires "the management of interdependencies between *the people* who perform those tasks."[20] In this framework, good teamwork is reliant on a "mutually reinforcing process of communicating and relating for the purpose of task integration," and captures key elements of existing conceptions of IP care, including aspects of interpersonal relationships (shared knowledge, shared goals, and mutual respect), and interpersonal communication (frequency, timeliness, accuracy, and problem-solving).[21] RC has been measured empirically in a variety of organizational settings, including health care. High levels of RC have been found to predict team performance outcomes, including health care quality, improved clinical outcomes, improved patient and clinician satisfaction and engagement, and shorter length of stay.[22–28] RC has been previously used as a pre-/post-evaluation of a successful IP curriculum designed to improve teaming skills.[29] For these reasons, RC was chosen as a valid and useful conceptual and measurement framework for evaluating the impact of iPACE on teaming.

The overall objective of the iPACE pilot was to obtain preliminary evidence on the feasibility and effectiveness of a multipronged intervention to promote IP care and education on an inpatient internal medicine (IM) teaching unit. The specific objectives were to determine the impact the intervention had on teaming, team member experience (including well-being and perceived quality of care and education), and patient experience.

What was known and gap
While integration of interprofessional care into traditional inpatient teaching services has been described as ideal, practice-based interventions have not been shown to improve collaborative behavior, clinician well-being, clinical processes, care efficiency, or patient outcomes.

What is new
An exploratory educational model to redesign the clinical learning environment to promote interprofessional care and education.

Limitations
The model was also created de novo for the purposes of this project in a new space with new staff so unit-specific pre-post implementation comparisons could not be made.

Bottom line
The pilot as implemented on an inpatient internal medicine teaching unit may have a positive effect on the clinical learning environment as measured by teaming and professional experience.

Methods

Setting and Participants

The iPACE model was implemented in June 2017 in a new IM inpatient teaching unit at MMC, a 637-bed tertiary care, independent academic medical center in Portland, Maine. ACGME grant funding was used to provide infrastructure for development and analysis of the intervention, but the iPACE unit received no additional operational support. During the period of evaluation, the unit consisted of 11 telemetry-capable general medical beds. Patients are assigned to the iPACE unit based on bed availability with no specific patient inclusion or exclusion criteria. All iPACE team patients are co-located on the unit. Attending physicians may have additional patients off unit.

Interventions

Structured bedside rounds are a cornerstone of iPACE and promote IP care and education on the unit. Each appointment aims to include all members of the care team and the patient/family. The rounding schedule is advertised daily to maximize patient and family participation. Patients may decline participation in bedside team rounds.

During rounds, clinical care and order entry occur simultaneously with patient interview and assessment. One common team progress note documents the assessment and plan for the day. IM residents typically initiate the note during round preparation,

TABLE 1
Metrics and Evaluation Plan

Construct	Theme	Measure	Description
Teaming	Team functionality	Relational coordination	Validated, proprietary survey measuring the quality of interpersonal communication and relationships involved in the coordination of work
Care team experience	Well-being	Adapted Mini-Z	Validated tool assessing satisfaction, stress, burnout, work control, chaos, values alignment, teamwork, documentation time pressure, and electronic health record usage/proficiency
Interprofessional education	Perceived quality of education and care	Survey data	Survey to assess provider perceptions of education and patient safety; questions were adapted from the literature, ACGME milestone competencies for internal medicine, and from the biannual MMC survey on institutional safety culture; questions were framed to be relevant to all members of the care team
	Perceptions of value of iPACE intervention	Focus groups	Structured, scripted interviews to obtain focused, formal feedback
Patient experience	Patient experiences with care	Patient experience survey	Survey to assess patient experience of the iPACE model (ie, elements of the model which could possibly result in a negative patient experience, such as size of the team and length of appointments)

Abbreviations: iPACE, Interprofessional Partnership to Advance Care and Education; ACGME, Accreditation Council for Graduate Medical Education; MMC, Maine Medical Center; N/A, not applicable.
[a] All respondents were asked to reflect on their experiences over the past 4 weeks in answering the survey questions. Survey participants were recruited via email invitations from department heads and education and nursing leaders. Up to 8 email reminders were sent to nonresponders.
[b] Pre-intervention sample occurred over 3 weeks (March 21–April 14, 2017) prior to the unit opening.
[c] Nurses and other staff assigned to the unit full-time were surveyed at 12 months. Physician and non-physician rotating staff were surveyed in the month following their rotation on iPACE model unit (March–August 2018).
[d] Each group met separately to minimize the impact of potential power differentials among participants. Logistical challenges prevented medical student and other IP team member participation.
[e] Patients experience were surveyed June to August 2018.

but any member of the team may scribe to allow learners to vary their role in rounds and ensure timely completion of the note.

The timing and duration of rounds preclude the IM team from attending traditional departmental lectures (ie, morning report). Therefore, educational opportunities designed to expose learners to best practices in IP collaborative care are purposefully integrated into the schedule. These include dedicated time for team-based bedside teaching, IP lunch and learn sessions, and in-depth IP case discussions (daily schedule provided as online supplemental material).

Outcomes

A pragmatic observational strategy was used. The mixed-methods approach included quantitative, qualitative, and clinical data to examine various key domains: Teaming, Care Team Experience, IP Education, and Patient Experience.

Pre- and post-iPACE implementation surveys measured the impact of the iPACE model on team functionality, well-being, and perceived care team experience. These constructs were measured using 3 different tools: the RC tool, the adapted Mini-Z,

TABLE 1
Metrics and Evaluation Plan (extended)

Items	Method of Administration	Sample	Measurement Timing	Comparison
7	Electronic survey[a]	iPACE interprofessional team members (attending physicians, nurses, medical students, internal medicine residents, therapists (speech, physical, occupational), pharmacists, and care coordinators)	Pre-intervention[b], 1-year post-intervention	Pre-implementation sample: representative members of the anticipated iPACE team on comparable inpatient medical units
9	Electronic survey[a]	iPACE interprofessional team members	Pre-intervention[b], 1-year post-intervention[c]	Pre-implementation sample: representative members of the anticipated iPACE team on comparable inpatient medical units
23	Electronic survey[a]	iPACE interprofessional team members	Pre-intervention[b], 1-year post-intervention[c]	Pre-implementation sample: representative members of the anticipated iPACE team on comparable inpatient medical units
N/A	One-hour interviews to obtain staff feedback about the impact of the iPACE model on clinical care, education, and provider well-being	Interns (2), residents (4), attending physicians (5), and nurses (4)[d]	9–10 months post-intervention	N/A
11	Paper survey	Patients/caregivers	1-year post-intervention[e]	N/A

and a perceived quality of education and care measure (all combined into a single survey). The pre-implementation sample consisted of representative members of the anticipated iPACE team on comparable inpatient medical units. The post-implementation sample consisted of iPACE unit team members, which included a mixture of members reassigned from the pre-implementation sample units and new staff. Purposeful sampling of IP team members was employed to promote representation of all groups. Responses were deidentified, analyzed, and are presented in aggregate.

The RC tool is a self-administered survey consisting of 7 questions: 4 on communication (frequency, timeliness, accuracy, and problem-solving) and 3 on relationships (shared goals, shared knowledge, and mutual respect). Participants were asked to consider performance in these areas for team members within their workgroup (eg, nurses and nurses) and between workgroups (eg, nurses and residents). Cardiologists were included in the pre-survey in anticipation of including cardiology patients in the model at a future date and were purposefully left out of the post-implementation survey. Relational Coordination Analytics scored each question for within group and between group performance and created an overall summary RC score using established and proprietary scoring algorithms. RC scores are reported on a 5-point scale. Supplementary analyses were conducted by the study team.

The impact of iPACE on well-being was assessed using an adaptation of the Mini-Z,[30] a validated tool that assesses perceptions of stress/burnout, workplace function/culture, and electronic health record usage. For this project, one item was removed, "The amount of time I spend on the electronic health record (EHR) at home," as it did not apply to all team members. No other changes were made. The tool was scored as

recommended by taking a simple sum of responses with reverse coding applied as needed.

Perceived care team experience was assessed using items adapted from the literature, the ACGME IM milestone competencies and the biannual MMC survey on institutional safety culture.[22,31,32] All questions were pilot tested with non-participant team members and modified if necessary prior to administration. A 5-point Likert scale was used.

Patient experience was assessed using survey items created with input from the MMC Patient and Family Advisory Council, the MMC Patient Experience Department, and MMC Patient Education Services for construct validity and health literacy level. The intent of this tool was to collect feedback on unique elements of the iPACE model in real time, which could result in a negative patient experience, such as size of the team or length of appointments. This information could not be obtained from other patient experience surveys (eg, HCAHPS). The surveys were distributed by the unit care coordinator to a convenience sample of patients and family members and collected anonymously.

Qualitative focus groups were conducted with iPACE team members to explore perceptions of the value of the intervention. An opportunistic recruiting strategy was employed (TABLE 1). Participation was limited by the number of individuals who had been exposed to the model. All groups were moderated by skilled qualitative researchers who were not involved in the iPACE unit. Food was served, but no other incentives were provided for participation. Moderators used scripted open-ended questions to probe key focus areas: IP care and teaming, well-being, IP education, patient-centered care, quality of care, and efficiency of care. Cognitive testing with representatives in each group was done to ensure understandability and meaningfulness of the questions. Interviews were audio recorded and transcribed by an external transcription service. Individual participants' names and personal identifiers were removed to maintain confidentiality.

Analysis of the Outcomes

Quantitative Data: Descriptive statistics were computed for all study variables. RC scores were computed by Relational Coordination Analytics, according to their proprietary algorithm; the strengths of all relationships within work groups and between work groups were assessed overall and by individual item. Pre- and post-implementation differences in outcome variables were assessed using chi-square tests or Fisher's exact tests, as appropriate, for categorical data and t tests for continuous data, including RC scores. Given observed differences in characteristics between comparison groups (provided as online supplemental material), linear regression models were used to assess outcomes controlling for respondent age and workgroup as a secondary analysis.

Qualitative Data: Focus group transcripts were manually analyzed using an inductive approach consistent with grounded theory (minimizing preconceptions, allowing themes to emerge). A coding schema was developed and applied to the transcripts based on the interview script by 2 investigators (S.H. and L.W.). The schema was further refined by consensus as additional themes were identified then reapplied to all 4 transcripts. In cases of possible discrepancy, the data were reviewed jointly, and conflicts were resolved through discussion.

A determination of non-research was obtained from the MMC Institutional Review Board for this QI project.

Results

Pre- and Post-iPACE Implementation Surveys

There were significant differences in the populations completing the pre-iPACE and iPACE implementation surveys. The post-implementation sample had a lower response rate (pre-iPACE 74% (113); iPACE 54% (32); $P = .008$). This group also had lower survey completion rates (pre-iPACE 59% (89); iPACE 46% (27); $P = .038$). The pre-iPACE respondents were older. There were no significant differences in gender or years in practice. There were significant differences in workgroup composition for the RC analysis (provided as supplemental material). Thirteen percent (15) of the pre-implementation RC workgroups were residents versus 9% (3) in the post-iPACE workgroups.

Relational Coordination

Overall RC scores were significantly higher in the iPACE group than in the pre-iPACE group both between and within workgroups (TABLE 2). Between workgroup scores on all 7 individual items were significantly higher in the iPACE group than the pre-iPACE group. Highly significant differences in the same direction were also seen in the within workgroup questions measuring accurate communication, shared goals, and mutual respect. Adjusting for respondent age and workgroup did not change results.

TABLE 2
Relational Coordination (RC) Outcomes Comparing Pre-iPACE Responses with iPACE Responses

Measure	RC Score Mean (SD)[a]			
	Pre-iPACE	iPACE	Unadjusted *P* Value	Adjusted[b] Difference (95% CI)
Overall RC between groups	3.72 (0.44)	4.26 (0.37)	< .0001	0.55 (0.35, 0.75)
Overall RC within groups	4.37 (0.43)	4.64 (0.35)	.003	0.30 (0.11, 0.49)
Frequent communication between	4.08 (0.70)	4.57 (0.32)	< .0001	0.45 (0.14, 0.76)
Frequent communication within	4.96 (0.27)	4.97 (0.18)	.87	0.04 (-0.09, 0.17)
Timely communication between	3.45 (0.57)	4.00 (0.47)	< .0001	0.52 (0.25, 0.79)
Timely communication within	4.06 (0.68)	4.33 (0.61)	.05	0.28 (-0.03, 0.59)
Accurate communication between	3.87 (0.63)	4.46 (0.47)	< .0001	0.57 (0.29, 0.85)
Accurate communication within	4.26 (0.58)	4.66 (0.48)	.001	0.34 (0.08, 0.60)
Problem-solving communication between	3.81 (0.48)	4.32 (0.51)	< .0001	0.53 (0.30, 0.76)
Problem-solving communication within	4.15 (0.54)	4.48 (0.78)	.040	0.33 (0.05, 0.61)
Shared goals between	3.86 (0.62)	4.39 (0.58)	< .0001	0.54 (0.25, 0.83)
Shared goals within	4.31 (0.60)	4.69 (0.47)	.002	0.37 (0.10, 0.64)
Shared knowledge between	3.30 (0.54)	3.88 (0.62)	< .0001	0.58 (0.32, 0.84)
Shared knowledge within	4.33 (0.74)	4.64 (0.62)	.05	0.28 (-0.05, 0.61)
Mutual respect between	3.62 (0.67)	4.30 (0.61)	< .0001	0.66 (0.34, 0.98)
Mutual respect within	4.26 (0.77)	4.71 (0.53)	.0007	0.47 (0.13, 0.81)

Abbreviation: iPACE, Interprofessional Partnership to Advance Care and Education.
[a] Higher scores represent stronger relational coordination.
[b] Adjusted for age and workgroup by linear regression analysis.

Well-Being

The overall mean adapted Mini-Z score (TABLE 3) did not differ between the groups (mean [SD] pre-iPACE 24.8 [4.5]; iPACE 23.6 [4.2]; $P = .22$).

Perceived Care Team Experience

iPACE respondents were much more likely to report that their experience had been professionally rewarding (mean [SD] iPACE 4.4 [0.6] vs pre-iPACE 3.5 [1.0], $P < .0001$). There was little to no difference between the 2 groups for the remainder of measures with the exception that iPACE respondents were less likely to report improved medical documentation over the past 4 weeks than pre-iPACE respondents (mean [SD] pre-iPACE 3.0 [0.9] vs iPACE 3.6 [1.0], $P = .010$). Regression models controlling for age and workgroup did not change results.

Patient Experience

Patient feedback on the iPACE model was very positive (TABLE 4). Patients felt that they knew when to expect the team and felt like active and involved members of the care team. Potentially negative aspects of the iPACE model as implemented on the pilot unit, such as team size and appointment length and frequency, were well-tolerated.

Qualitative Interview Findings

Overall, it was thought that the iPACE model was successful in teaching best practices in IP care (TABLE 5) and allowed for more direct observation of learners. However, there were perceived disadvantages, including concerns that the model may hinder physician role development through reduced clinical autonomy and limiting access to traditional learning modalities and venues. Learning and presenting in front of the team and patients also had the potential to cause insecurity and impact perceptions of role. Success of the model may also be overly dependent on individual team members (especially the attending physician). As a result, some residents questioned the value and practicality of the iPACE rotation. The shared team progress note was also not well received due to perceptions that it did not meet all team members' documentation needs.

Discussion

This project reports the outcomes associated with implementation of the iPACE pilot on an inpatient IM unit and its impact on the clinical learning climate, specifically teaming, well-being, perceived educational value, and patient experience.

TABLE 3
Well-Being and Perceived Care Team Experience Comparing Pre-iPACE Responses with iPACE Responses

Item	Survey Score Mean (SD)[a]			
	Pre-iPACE	iPACE	*P* Value	Adjusted[b] Difference (95% CI)
Clinical provider well-being				
Mini-Z[c]	24.8 (4.5)	23.6 (4.2)	.22	-1.58 (-3.66, 0.50)
Perceived care team experience				
Team communication	3.7 (0.81)	4.1 (0.84)	.028	0.44 (0.04, 0.84)
Team relationship	3.8 (0.68)	4.0 (0.94)	.31	0.23 (-0.13, 0.59)
Balance (patient care vs education)	2.5 (0.86)	2.5 (0.88)	> .99	0.11 (-0.27, 0.49)
Contribute to understanding diagnosis	3.9 (1.01)	4.1 (1.04)	.48	0.01 (-0.46, 0.48)
Contribute to management plan	3.9 (1.06)	3.8 (1.14)	.68	-0.37 (-0.85, 0.11)
Improve clinical knowledge	3.8 (1.07)	3.9 (1.21)	.56	0.18 (-0.35, 0.71)
Identify opportunities to improve care	3.5 (1.04)	3.4 (1.12)	.95	-0.18 (-0.69, 0.33)
Minimize redundant care processes	3.0 (1.09)	3.4 (0.98)	.11	0.29 (-0.24, 0.82)
Respect patients' preferences	4.0 (0.99)	3.9 (1.06)	.59	-0.08 (-0.58, 0.42)
Communicate effectively with patients	4.1 (1.00)	3.9 (1.00)	.47	-0.16 (-0.64, 0.32)
Improve skills teaching other health professionals	3.2 (1.15)	3.4 (1.17)	.44	0.41 (-0.12, 0.94)
Improve patient communication	3.8 (0.93)	4.0 (0.84)	.34	0.30 (-0.12, 0.72)
Improve medical documentation	3.6 (0.99)	3.0 (0.94)	.010	-0.27 (-0.70, 0.16)
Improve clinical reasoning	3.7 (0.92)	3.6 (0.79)	.41	-0.09 (-0.50, 0.32)
Experience professionally rewarding	3.5 (1.00)	4.4 (0.62)	< .0001	0.84 (0.41, 1.27)
Quality of professional education	3.5 (0.91)	3.5 (1.14)	.83	0.13 (-0.33, 0.59)
Ability to identify threats to patient safety	4.3 (0.73)	4.4 (0.68)	.84	0.06 (-0.26, 0.38)
Ability to raise concerns about patient safety	4.4 (0.67)	4.5 (0.58)	.64	0.11 (-0.18, 0.40)
Ability to make change for patient safety	3.9 (0.98)	4.1 (0.80)	.33	0.27 (-0.15, 0.69)
Team will speak up about problems with patient care	4.2 (0.82)	4.5 (0.69)	.08	0.31 (-0.06, 0.68)
Team actively doing things to improve patient safety	4.0 (0.95)	4.4 (0.83)	.05	0.46 (0.04, 0.88)
Overall rating for patient safety	4.0 (0.65)	4.0 (0.66)	.73	0.13 (-0.19, 0.45)
Overall rating for patient-centered care	3.9 (0.73)	4.2 (0.71)	.07	0.32 (-0.03, 0.67)

Abbreviation: iPACE, Interprofessional Partnership to Advance Care and Education.
[a] Range 1–5 (lower scores worse).
[b] Adjusted for age and workgroup by linear regression analysis.
[c] Lower scores represent lower levels of burnout.

The evaluation of the iPACE model was challenging in several ways. As a QI project, rapid cycle changes in model implementation were encouraged, which prevented measurement of continuous process data. The iPACE unit was also created de novo for the purposes of this project in a new space with new staff so unit-specific pre-post implementation comparisons could not be made. This required us to use a pragmatic observational approach which impacted our ability to assess the efficacy of the intervention and created significant discrepancies between the pre-implementation sample (taken from 3 units) and the post-implementation sample (limited to 1 unit). While our response rate for the post-implementation survey was consistent with busy clinicians in a naturalistic setting, the absolute number of team members available to survey caused some groups (ie, residents, medical students, and therapists) to be underrepresented. The post-implementation survey also had a long response window of varying lengths dependent on role to attempt to capture as many respondents as possible, which led to differences in exposure in the model. We attempted to minimize this effect by asking them to reflect only on the past 4 weeks. The current plan is to continue to spread the iPACE model to other medicine units and adapt it to different clinical care settings within the institution. This will allow for a more rigorous pre-/post-implementation evaluation of the iPACE model in the future.

TABLE 4
Patient Experience Survey

Item	Strongly Agree, No. (%)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)	Strongly Disagree, No. (%)	Sample Comments
I knew when to expect my team (N = 19)	11 (58)	4 (21)	4 (21)	0	0	"Telephone communication alerted me as to the arrival of team. Thank you!"
My team had too many people on it (N = 20)	2 (10)	0	5 (25)	5 (25)	8 (40)	"Each person added to the overall care delivered to me."
I felt I didn't know the roles of all the people on my team (N = 20)	1 (5)	0	4 (20)	7 (35)	8 (40)	"I knew the roles, everyone was super and helpful to one another."
I felt I was an active member of my care team and not just an observer (N = 19)	11 (58)	5 (26)	2 (11)	0	1 (5)	"Our team of doctors have given us options along the way and have explained each on in detail."
The care team talked to me often about my treatment plan (N = 20)	12 (60)	7 (35)	1 (5)	0	0	"Each step was explained in detail."
The care team meetings helped me understand my treatment plan (N = 20)	12 (60)	8 (40)	0	0	0	"I was always given an explanation and answer to my questions."
Patient appointments were too long (N = 18)	0	0	7 (39)	5 (28)	6 (33)	"Maybe a little. Although I greatly appreciated their thoroughness and compassion. . ."
Patient care appointments didn't need to be done every day (N = 18)	0	2 (11)	6 (33)	5 (28)	5 (28)	"Appointments ever day provides continuity; no guessing."

iPACE respondents were less likely to report improvements in medical documentation over the previous 4 weeks than pre-iPACE respondents. Feedback suggests that the common team progress note did not fully meet the needs of all team members (ie, did not incorporate nursing-specific treatments/assessments and care plans requiring separate documentation, etc). This is being addressed as part of ongoing QI initiatives.

Attending physicians who participated in the early implementation of the iPACE model were selected for their interest in IP collaborative practice. While the roster was later broadened to include all IM teaching attending physicians, participant feedback suggests that the iPACE model may be dependent on the attending and observed outcomes might have been different had attendings been initially assigned at random. Many of the nurses on the unit were also recent graduates, which may have impacted their acceptance of the model and study outcomes.

Lastly, the data suggest that some trainees had difficulty recognizing the educational value of the iPACE model. While this finding is limited by the small number of residents sampled, it is an important finding given GME priorities regarding teaming and collaborative skills development and supports previous work that residents do not always see IP teamwork or rounds as educationally meaningful.[33,34] Increasing resident independence in future iterations of the model may improve acceptance and engagement in IP training.[35,36] As the iPACE model is disseminated throughout our institution, there are plans to re-evaluate the resident schedule to provide increased autonomy and accommodate participation in traditional didactics. Future projects will also explore resident perceptions of the impact of IP education and collaborative practice on education.

Conclusions

The iPACE pilot as implemented on an inpatient IM teaching unit may have a positive effect on the clinical learning environment as measured by teaming and professional experience. Patients also had a positive experience with the model. While residents appreciated the team collegiality and IP skill development, acceptability may be limited by perceptions of decreased autonomy and concern for impact on physician role development.

TABLE 5
Focus Group Feedback

Themes	Examples	Quotes
Teaming	Cohorting increases feeling of "teaming" and understanding of role through enhanced opportunities for social interaction	"[The] collegial vibe was so much more pleasant to me than having one nurse on one floor that I barely had time to talk to, and is always paging me. . ." –Resident
		"I don't think I know a single physical therapist from working on other floors, and we would hang out and have lunch on iPACE. So you kind of get to know them. You get to know what they do day-to-day; get to know what they're looking for when they're looking at a patient. So yeah, it's definitely helpful." –Intern
Perceived educational opportunities	Allows opportunity for observation for both learners and educators	"I think the biggest benefit is just seeing and observing how other providers communicate with patients about their diagnosis, therapies, doing shared decision-making. I think observing each other is really the biggest thing that they gain that they get less of—not that they don't get at all, but they'll get less of in other models." –Attending
	Allows opportunity for resident interprofessional skill development	"There's a lot of things that I learned. . .that we're not trained in medical school. . .You're not trained about the jobs of other people. And where do you fall in that hierarchy? And what is the responsibility of those people? . . .We're not told how that works. There's not even a piece of paper given to you telling [what is] everything. So yes, it helped understand the goal of the inter-professional team." –Intern
Perceived educational threats	Success is dependent on the individuals who comprise the team (especially the attending physician)	"I think it's tough if you have a learner that isn't up to par with other learners too. Because everything is so dependent on them that if they have trouble taking a history or they have trouble synthesizing things then the majority of those patients, you are struggling through that with them. So I think it is a tougher model for someone that may have some deficiencies." –Attending
		"[It can be hard] especially if it's a new attending that doesn't particularly value the input from the nurses starting with a new group of residents. I think that sets it off on a really bad for the whole month for them. . .And it's crazy the difference. It's like some weeks. . .I couldn't imagine working anywhere else, it's amazing. It's perfect, I love it. And then other weeks it's like, whoa, we are not meshing for some reason." –Nurse(s)
		"Attendings. . .made a lot of difference, because some attendings helped us get our checklist done and our computer work done and things like that and other attendings didn't. And then other attendings wanted to run the computer so I had no computer. And then it just, I think it's very attending dependent on how the time feels." –Resident
	Rounds were perceived opportunities for patient-family learning over the needs of resident learning	"I felt like this whole iPACE model was all for the patients and as a resident I lost a lot of like the positive things I get from a gen med experience. In terms of like the medicine piece I guess." –Resident
	Learning "in front of an audience" was a source of insecurity and did not allow for preparation for team roles (including teaching), independent study, and reflection	"I felt so insecure because you do everything on the fly in the room and I'm just not good at that yet. I'm not at that level." –Resident
		"I was able to do the medical student thing. . .'Well maybe I would do this.'. . . 'Well this might be better or this would.' I don't know if it eroded my confidence in my ability, but it didn't necessarily strengthen my confidence in my ability to do that." –Intern

TABLE 5
Focus Group Feedback (continued)

Themes	Examples	Quotes
	Requiring notes to be done prior to the end of rounds require attending physicians and/or senior residents to take a traditional "intern" role in terms of information gathering or scribing, which deprives the interns of the experience of how to efficiently gather/synthesize data and the senior resident/attending of teaching and leading a team	"[For] a lot of the data capture we're utilizing either the attending and the senior resident. . .alternating between the 2 in order to maximize the ability to teach and lead the rounds. . .if there was a way to remove some of that burden from. . .the people who are trying to teach the patient, trying to teach the medical student and trying to critically think about the situation [that would help] because all the work of doctoring is happening in the confines of this encounter." –Attending
		"[Learners] use their time to write their note as a way to synthesize everything that's going on. Make sure that they're being complete in their thought process. So I know the learners I was working with and I felt it sometimes too that because we're doing that all at once and trying to get through it really rapidly in the room, that there's maybe something that you're losing with that as far as making sure that your clinical thinking is really complete." –Attending
	Perceived loss of clinical autonomy and resultant learning opportunities	"I felt less like I was managing the patient and more that the team was managing the patient. . ." –Intern
		"When your attending is next to you all the time, you're safe. And there's a tremendous amount of learning that happens from that. There's a huge amount of learning that also can never happen." –Attending
	Perceived loss of traditional learning venues, including the opportunity for pre-rounding and bedside teaching	"The drawback on iPACE was we were rounding for so long that we would miss a lot of our conference time. . .grand rounds. . .morning reports, so [we missed] these educational opportunities. . . In the afternoons, we'd have like a lecture once or twice a week. . .but it really wasn't the same as going to like a grand rounds and working through a case with like a big group of people." –Intern
		"I think there's also less time for literature review or reading about things on up-to-date. It's hard to do in the patient room. . .it probably makes the family a little uneasy if you're not sure what's going on." –Resident
	Autonomy and limited time for independent learning and synthesis impacted medical students more, especially since their role is unclear in this model	"I felt like this was not a very good rotation for med students compared to other gen med rotations because the roles aren't as [defined]—everything is kind of intermeshed. . .the med students did not really do their own notes. They didn't really come up with their own assessment and plans. They tried to as best they could on the fly in the room, but I feel like that was missing because, I tried to give my med students some time to like pre-round on their patients, but it never, it didn't always work with the schedule." –Resident
		"I've seen it is sort of the same stage fright from maybe the medical student standpoint. But I think particularly the third-year students, not necessarily the fourth-year students. They're just not used to the hospitals. They're not used to sort of what their role is I think to a certain degree." –Attending
	Unclear value of interprofessional education	"I think it's harder for the learners to appreciate that type (IPE) of learning more, so they want like the nuggets. They want to be like, 'I mastered SIADH today.' And so, I think that even though it is learning going on it doesn't feel like the same type of learning that they're used to or that they're expecting. . . to check a box for their board preparation and stuff." –Attending
		"Yeah, I guess [the skills learned on iPACE are] a leadership quality that maybe some people enjoy, and others it could be a teaching opportunity that they don't particularly care for, because it is a lot of micro-managing that really has nothing to do with education as far as basic medical training. . . there's less textbook, more just practical hospital skills." –Resident

TABLE 5
Focus Group Feedback (continued)

Themes	Examples	Quotes
	iPACE model doesn't teach skills necessary for current practice	"I felt [behind in my training because I did iPACE instead of a gen med rotation]…even though iPACE was gen medicine because the traditional way is knowing how to round on your patients fast enough by yourself in the morning rounding with your group and being able to write 8 notes and get that done…I was inefficient with that because I had had the support [on iPACE] and I hadn't had to…I felt like I was a month behind in learning how to be efficient in the actual way we run the hospital." –Intern
Other model elements	Common progress note content does not fully meet the needs of team members	"[The common team progress note] misses a lot of things that [nursing is] responsible for and [the doctors] are not. Like even if I say that I physically assessed the patient with the doctor, and that their note counts as my charting, they didn't document on all their wounds, and their skin. That I'm responsible to document on that. They didn't document on their IV. They didn't document on daily cares. They didn't document care plan and all that stuff I'm still responsible for. So basically I'm just not charting their heart and lungs." –Nurse

Abbreviation: iPACE, Interprofessional Partnership to Advance Care and Education.

References

1. Accreditation Council for Graduate Medical Education. ACGME Common Program Requirements. https://www.acgme.org/What-We-Do/Accreditation/Common-Program-Requirements. Accessed August 28, 2020.
2. Bellini LM, Ende J. Toward a utopian model for teaching and nonteaching services: every journey begins with a first step. *Acad Med*. 2018;93(1):13–15. doi:10.1097/ACM.0000000000001834.
3. Bhamidipati VS, Elliott DJ, Justice EM, Belleh E, Sonnad SS, Robinson EJ. Structure and outcomes of interdisciplinary rounds in hospitalized medicine patients: a systematic review and suggested taxonomy. *J Hosp Med*. 2016;11(7):513–523. doi:10.1002/jhm.2575.
4. Pannick S, Davis R, Ashrafian H, Byrne BE, Beveridge I, Athanasiou T, et al. Effects of interdisciplinary team care interventions on general medical wards: a systematic review. *JAMA Intern Med*. 2015;175(8):1288–1298. doi:10.1001/jamainternmed.2015.2421.
5. Ratelle JT, Sawatsky AP, Kashiwagi DT, Schouten WM, Erwin PJ, Gonzalo JD, et al. Implementing bedside rounds to improve patient-centred outcomes: a systematic review. *BMJ Qual Saf*. 2019;28(4):317–326. doi:10.1136/bmjqs-2017-007778.
6. Reeves S, Fletcher S, Barr H, Birch I, Boet S, Davies N, et al. A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39. *Med Teach*. 2016;38(7):656–668. doi:10.3109/0142159X.2016.1173663.
7. Dow A, Thibault G. Interprofessional education - a foundation for a new approach to health care. *N Engl J Med*. 2017;377(9):803–805. doi:10.1056/NEJMp1705665.
8. McMahon GT, Katz JT, Thorndike ME, Levy BD, Loscalzo J. Evaluation of a redesign initiative in an internal-medicine residency. *N Engl J Med*. 2010;362(14):1304–1311. doi:10.1056/NEJMsa0908136.
9. O'Leary KJ, Sehgal NL, Terrell G, Williams MV. Interdisciplinary teamwork in hospitals: a review and practical recommendations for improvement. *J Hosp Med*. 2012;7(1):48–54. doi:10.1002/jhm.970.
10. Weller J, Boyd M, Cumin D. Teams, tribes and patient safety: overcoming barriers to effective teamwork in healthcare. *Postgrad Med J*. 2014;90(1061):149–154. doi:10.1136/postgradmedj-2012-131168.
11. Hall LW, Zierler BK. Interprofessional education and practice guide No. 1: developing faculty to effectively facilitate interprofessional education. *J Interprof Care*. 2015;29(1):3–7. doi:10.3109/13561820.2014.937483.
12. Reilly JB, Bennett N, Fosnocht K, Williams K, Kangovi S, Jackson R, et al. Redesigning rounds: towards a more

purposeful approach to inpatient teaching and learning. *Acad Med*. 2015;90(4):450–453. doi:10.1097/ACM.0000000000000579.
13. Clay-Williams R, Plumb J, Luscombe GM, Hawke C, Dalton H, Shanon G, et al. Improving teamwork and patient outcomes with daily structured interdisciplinary bedside rounds: a multimethod evaluation. *J Hosp Med*. 2018;13(5):311–317. doi:10.12788/jhm.2850.
14. Li J, Talari P, Kelly A, Latham B, Dotson S, Manning K, et al. Interprofessional Teamwork Innovation Model (ITIM) to promote communication and patient-centred, coordinated care. *BMJ Qual Saf*. 2018;27(9):700–709. doi:10.1136/bmjqs-2017-007369.
15. Stein J, Shapiro S. Modernizing rounds. *Ann Intern Med*. 2018;168(12):903–904. doi:10.7326/L18-0144.
16. Shoemaker SJ, Parchman ML, Fuda KK, Schaefer J, Levin J, Hunt M, et al. A review of instruments to measure interprofessional team-based primary care. *J Interprof Care*. 2016;30(4):423–432. doi:10.3109/13561820.2016.1154023.
17. Tilden VP, Eckstrom E, Dieckmann NF. Development of the assessment for collaborative environments (ACE-15): a tool to measure perceptions of interprofessional "teamness". *J Interprof Care*. 2016;30(3):288–294. doi:10.3109/13561820.2015.1137891.
18. Mosher HJ, Kaboli PJ. Inpatient interdisciplinary care: can the goose lay some golden eggs? *JAMA Intern Med*. 2015;175(8):1298–1300. doi:10.1001/jamainternmed.2015.2430.
19. O'Leary KJ, Johnson JK, Auerbach AD. Do interdisciplinary rounds improve patient outcomes? Only if they improve teamwork. *J Hosp Med*. 2016;11(7):524–525. doi:10.1002/jhm.2587.
20. Gittell JH. What is relational coordination? In: *High Performance Healthcare: Using the Power of Relationships to Achieve Quality, Efficiency and Resilience*. New York, NY: McGraw-Hill Education; 2018.
21. Valentine MA, Nembhard IM, Edmondson AC. Measuring teamwork in health care settings: a review of survey instruments. *Med Care*. 2015;53(4):e16–e30. doi:10.1097/MLR.0b013e31827feef6.
22. Accreditation Council for Graduate Medical Education. Internal Medicine. https://www.acgme.org/Specialties/Overview/pfcatid/2/Internal-Medicine. Accessed August 19, 2020.
23. Gittell JH, Fairfield KM, Bierbaum B, Head W, Jackson R, Kelly M, et al. Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients. *Med Care*. 2000;38(8):807–819. doi:10.1097/00005650-200008000-00005.
24. Gittell JH, Logan C, Cronenwett J, Foster TC, Freeman R, Godfrey M, et al. Impact of relational coordination on staff and patient outcomes in outpatient surgical clinics. *Health Care Manage Rev*. 2020;45(1):12–20. doi:10.1097/HMR.0000000000000192.
25. Gittell JH, Weinberg D, Bennett A, Miller JA. Is the doctor in? A relational approach to job design and the coordination of work. *Human Res Manag*. 2008;47(4):729–755. https://doi.org/10.1002/hrm.20242.
26. Hartgerink JM, Cramm JM, Bakker TJ, van Eijsden RA, Mackenbach JP, Nieboer AP. The importance of relational coordination for integrated care delivery to older patients in the hospital. *J Nurs Manag*. 2014;22(2):248–256. doi:10.1111/j.1365-2834.2012.01481.x.
27. Havens DS, Gittell JH, Vasey J. Impact of relational coordination on nurse job satisfaction, work engagement and burnout: achieving the quadruple aim. *J Nurs Adm*. 2018;48(3):132–140. doi:10.1097/NNA.0000000000000587.
28. Havens DS, Vasey J, Gittell JH, Lin WT. Relational coordination among nurses and other providers: impact on the quality of patient care. *J Nurs Manag*. 2010;18(8):926–937. doi:10.1111/j.1365-2834.2010.01138.x.
29. Valenziano K, Glod S, Jia S, Belser A, Brazell B, Dellasega C, et al. An interprofessional curriculum to advance relational coordination and professionalism in early-career practitioners. *MedEdPORTAL*. 2018;14:10697. doi: 10.15766/mep_2374-8265.10697.
30. Linzer M, Poplau S, Grossman E, Varkey A, Yale S, Williams E, et al. A cluster randomized trial of interventions to improve work conditions and clinician burnout in primary care: results from the Healthy Work Place (HWP) study. *J Gen Intern Med*. 2015;30(8):1105–1111. doi:10.1007/s11606-015-3235-4.
31. Bennett NL, Flesch JD, Cronholm P, Reilly JB, Ende J. Bringing rounds back to the patient: a one-year evaluation of the chiefs' service model for inpatient teaching. *Acad Med*. 2017;92(4):528–536. doi:10.1097/ACM.0000000000001459.
32. Ratanawongsa N, Federowicz MA, Christmas C, Hanyok LA, Record JD, Hellmann DB, et al. Effects of a focused patient-centered care curriculum on the experiences of internal medicine residents and their patients. *J Gen Intern Med*. 2012;27(4):473–477. doi:10.1007/s11606-011-1881-8.
33. Soones TN, O'Brien BC, Julian KA. Internal medicine residents' perceptions of team-based care and its educational value in the continuity clinic: a qualitative study. *J Gen Intern Med*. 2015;30(9):1279–1285. doi:10.1007/s11606-015-3228-3.
34. Monash B, Najafi N, Mourad M, Rajkomar A, Ranji SR, Fang MC, et al. Standardized attending rounds to improve the patient experience: a pragmatic cluster

randomized controlled trial. *J Hosp Med*. 2017;12(3):143–149. doi:10.12788/jhm.2694.
35. Morphet J, Hood K, Cant R, Baulch J, Gilbee A, Sandry K. Teaching teamwork: an evaluation of an interprofessional training ward placement for health care students. *Adv Med Educ Pract*. 2014;5:197–204. doi:10.2147/AMEP.S61189.
36. Visser CLF, Kusurkar RA, Croiset G, Ten Cate O, Westerveld HE. Students' motivation for interprofessional collaboration after their experience on an IPE ward: a qualitative analysis framed by self-determination theory. *Med Teach*. 201941(1):44–52. doi:10.1080/0142159X.2018.1436759.

Sarah Hallen, MD, is Assistant Professor of Medicine, Tufts University School of Medicine; **Thomas Van der Kloot, MD,** is Assistant Clinical Professor of Medicine, Tufts University School of Medicine; **Christyna McCormack** is Interprofessional Partnership to Advance Care and Education Project Director, Maine Medical Center; **Paul K. J. Han, MD, MPH,** is Director, Center for Outcomes Research and Evaluation, Maine Medical Center, and Associate Professor of Medicine, Tufts University School of Medicine; **Frances L. Lucas, PhD,** is Assistant Professor of Medicine, Tufts University School of Medicine; **Lisbeth Wierda, MPH,** is Project Manager, Center for Outcomes Research and Evaluation, Maine Medical Center; **Daniel Meyer, MD,** is Assistant Professor of Medicine, Tufts University School of Medicine, and Division Director, Division of Hospital Medicine, Department of Medicine, Maine Medical Center; **Kalli Varaklis, MD, MSEd,** is Associate Professor of Obstetrics and Gynecology, Tufts University School of Medicine, and Designated Institutional Official, Maine Medical Center; and **Robert Bing-You, MD, MEd, MBA,** is Professor of Medicine, Tufts University School of Medicine, and Vice President for Medical Education, Maine Medical Center.

Funding: This study was funded by an Accreditation Council for Graduate Medical Education (ACGME) Pursuing Excellence in Clinical Learning Environments Grant.

Conflict of interest: The authors declare they have no competing interests.

The authors would like to thank Andrea Siewers, MS, for her assistance in developing the initial project metric plan; Caitlin Gutheil, MS, for her assistance in conducting the qualitative interviews; and Laurie Burton, RN-BSN, and Carrie Peoples, RN-BSN, for their assistance in model development and implementation.

Corresponding author: Sarah Hallen, MD, Maine Medical Center, Division of Geriatric Medicine, 66 Bramhall Street, Portland, ME 04102, 207.662.3157, halles@mmc.org

Received September 26, 2019; revisions received February 17, 2020, and June 17, 2020; accepted July 23, 2020.