Implementing a Family-Centered Rounds Intervention Using Novel Mentor-Trios

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abstract

BACKGROUND AND OBJECTIVES: Patient and Family Centered I-PASS (PFC I-PASS) emphasizes family and nurse engagement, health literacy, and structured communication on family-centered rounds organized around the I-PASS framework (Illness severity-Patient summary-Action items-Situational awareness-Synthesis by receiver). We assessed adherence, safety, and experience after implementing PFC I-PASS using a novel "Mentor-Trio" implementation approach with multidisciplinary parent-nurse-physician teams coaching sites.

METHODS: Hybrid Type II effectiveness-implementation study from 2/29/19-3/13/22 with ≥3 months of baseline and 12 months of postimplementation data collection/site across 21 US community and tertiary pediatric teaching hospitals. We conducted rounds observations and surveyed nurses, physicians, and Arabic/Chinese/English/Spanish-speaking patients/parents. (Continued)

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WHAT'S KNOWN ON THIS SUBJECT: Family-centered rounds improve patient safety and hospital experience. However, family-centered rounds buy-in, adherence, and implementation strategies vary. Mentored-Implementation can successfully coach sites in implementing hospital-based interventions but is typically physician-centric and does not include patients/families and nurses.

WHAT THIS STUDY ADDS: We successfully implemented a family-centered rounds intervention across 21 hospitals using novel Mentor-Trios involving parent-nurse-physician triads coaching sites. Safety climate and rounds adherence improved post-implementation; resident-reported harms decreased in larger hospitals and those with greater intervention adherence and nurse engagement.

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RESULTS: We conducted 4557 rounds observations and received 2285 patient/family, 1240 resident, 819 nurse, and 378 attending surveys. Adherence to all I-PASS components, bedside rounding, written rounds summaries, family and nurse engagement, and plain language improved post-implementation (13.0%–60.8% absolute increase by item), all $P < .05$. Except for written summary, improvements sustained 12 months post-implementation. Resident-reported harms/1000-resident-days were unchanged overall but decreased in larger hospitals (116.9 to 86.3 to 72.3 pre versus early- versus late-implementation, $P = .006$), hospitals with greater nurse engagement on rounds (110.6 to 73.3 to 65.3, $P < .001$), and greater adherence to I-PASS structure (95.3 to 73.6 to 72.3, $P < .05$). Twelve of 12 measures of staff safety climate improved (eg, "excellent"/"very good" safety grade improved from 80.4% to 86.3% to 88.0%), all $P < .05$. Patient/family experience and teaching were unchanged.

CONCLUSIONS: Hospitals successfully used Mentor-Trios to implement PFC I-PASS. Family/nurse engagement, safety climate, and harms improved in larger hospitals and hospitals with better nurse engagement and intervention adherence. Patient/family experience and teaching were not affected.

Communication failures frequently cause harmful errors.[1] High-reliability structured provider communication improves patient safety.[2] However, communication with patients and families is understudied. Patient and family-centered rounds (PFCR) improve provider-patient and family communication[3–6] and are a best practice per the Institute for Patient and Family-Centered Care[3] and the American Academy of Pediatrics.[7,8] Although common in pediatrics, PFCR have not fully achieved their potential to improve communication because they are often implemented inconsistently, more physician- than family-centered, replete with medical jargon, and inconsistently engage patients and families and nurses.[4,5,9–12] Support for PFCR also varies among residents, attending physicians, and nurses.[13]

We previously coproduced with parents, nurses, and physicians a PFCR intervention, Patient and Family Centered I-PASS (PFC I-PASS).[14,15] PFC I-PASS emphasized family and nurse engagement, health literacy, and high-reliability structured bidirectional written and verbal communication organized around the I-PASS (Illness severity-Patient summary-Action items-Situational awareness-Synthesis by receiver) framework. After implementing PFC I-PASS in 7 centers, harmful medical errors dropped 38% and hospital experience improved; rounds duration and teaching remained unchanged.[14]

To inform widespread dissemination, we sought to test PFC I-PASS implementation and real-world effectiveness in a broader group of US community and tertiary pediatric teaching hospitals. Recognizing that hospital-based quality improvement (QI) interventions are often physician-centric or nurse-centric,[16] we implemented PFC I-PASS using a novel interdisciplinary implementation strategy involving coaching by parent, nurse, and physician mentors (Mentor-Trios). We hypothesized that intervention adherence and sustainment, safety climate, harmful errors, and hospital experience would improve post-implementation.

METHODS

Design

We conducted a prospective hybrid-type-II-effectiveness-implementation[17] study on 21 US teaching hospitals' pediatric inpatient units from February 29, 2019 to March 13, 2022. Hybrid-type II-effectiveness-implementation studies equally focus on intervention effectiveness and implementation.[17] We collected staggered data across sites (≥3 months pre-implementation, then 12-months intensive Mentored-Implementation data collection/site). Boston Children's Hospital's Institutional Review Board provided approval.

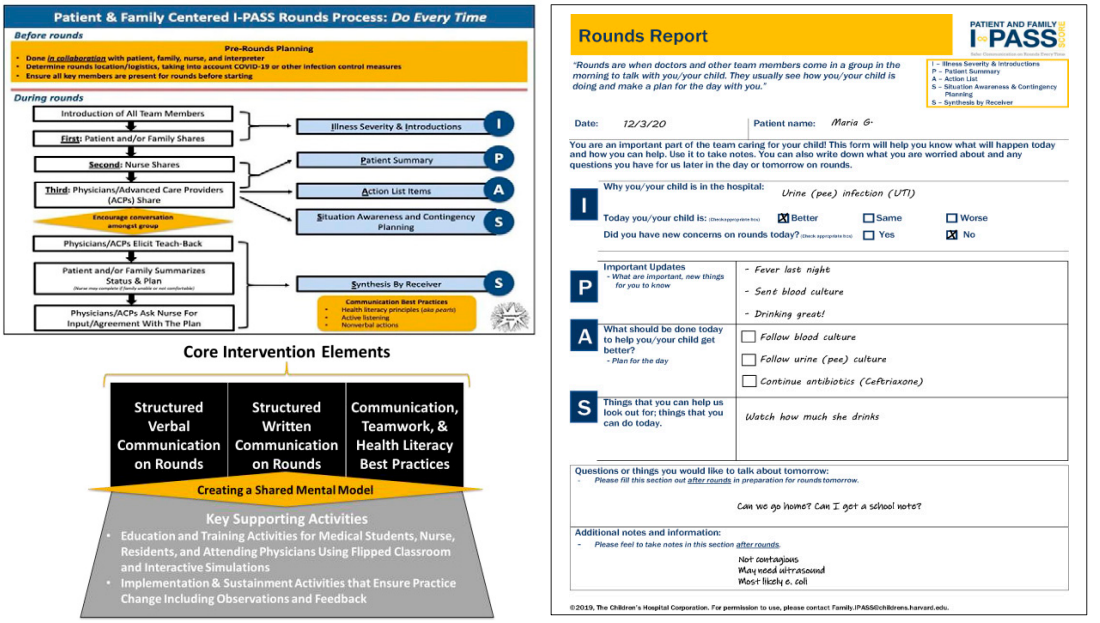
Sites

Thirty sites applied to participate, providing information about hospital, residency program, study team, PFCRs, and I-PASS handoffs experience. A multidisciplinary parent-nurse-physician team selected 21 sites (Supplemental Fig 5) based on geographic diversity, hospital type (tertiary or community), residency size, and PFCR experience.

Sites included 14 nested children's hospitals, 4 free-standing children's hospitals, and 3 general hospitals. Twelve were tertiary care teaching hospitals, and 9 community teaching hospitals. Residency size ranged from 16 to 150 residents. Rounding team structure varied (eg, interns and third-year-residents versus interns and second-year-residents). Twenty hospitals implemented on general pediatric (nonintensive care) units, and 1 on pediatric neurology. Sites variably practiced PFCRs (<5 years [$n = 5$], 5–10 years [$n = 9$], >10 years [$n = 7$]); none previously used I-PASS for PFCR.

Intervention

Our intervention, PFC I-PASS,[14,18] is a structured verbal and written rounds communication framework organized around



Mentored Implementation with the Novel "Mentor-Trio" Model

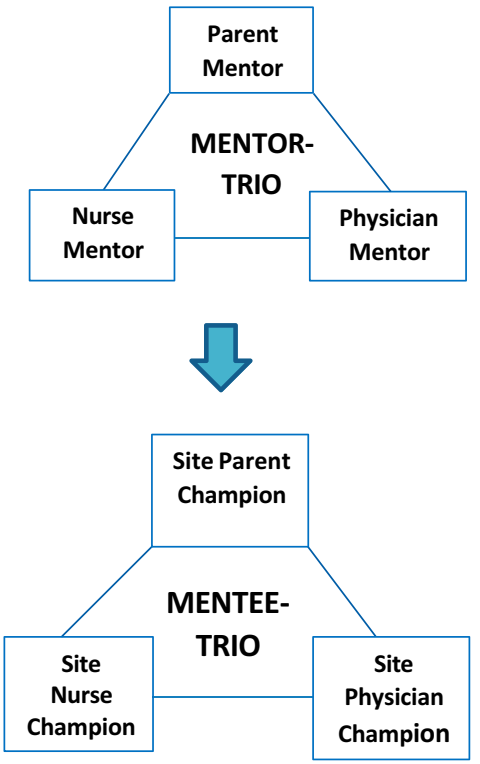


FIGURE 1

PFC I-PASS intervention. Key intervention supporting activities include education and training activities for medical students, nurses, residents, and attending physicians using a flipped classroom and interactive simulations, as well as implementation and sustainment activities that ensure practice change, including observations and feedback. The PFC I-PASS rounding process included several required elements, including prerounds planning, accounting for interpretation needs, taking infection-control precautions, and ensuring all key team members were present. During rounds, providers introduced team members, invited patient or family to share first, nurse to share second, and then resident or advanced care provider to share next. Health literacy best principles (eg, avoiding medical jargon, using simple vocabulary), active listening, and nonverbal cues were incorporated into rounds. Rounding

I-PASS structure, supported by communication, teamwork, and health literacy best practices to ensure a shared mental model (Fig 1).[14] We adapted PFC I-PASS for larger-scale implementation by streamlining resident training and incorporating novel educational techniques (eg, flipped-classroom, virtual learning).[15,19]

Our implementation strategy (Mentored Implementation), pioneered by the Society of Hospital Medicine[20] in multiple domains,[21–23] involves content experts (typically physicians) intensively coaching hospitals to implement large-scale QI projects. Informed by principles of coproduction[24] with families and nurses, we refined Mentored Implementation using a novel Mentor-Trio approach, where triads of parent-nurse-physician mentors drawn from 7 parents, 6 nurses, and 16 physicians coached sites in implementing PFC I-PASS. Most Mentors previously participated in our 7-center PFC I-PASS Study.[14] Experienced senior physician-mentors further guided Mentor-Trios. Mentors participated in monthly all-mentor calls for mentor training and support on PFC I-PASS and received pretemplated slide decks with standardized, tailored prompts for monthly site calls. We paired central Mentor-Trios with local "Mentee-Trios" (parent, nurse, and physician project champions) leading site-level implementation. Mentor-Trios met with sites monthly via teleconference to review stakeholder engagement, intervention adherence (run charts), plan-do-study-act cycles, and intervention challenges and strategies.

When COVID-19 began, sites varied in implementation phase: pre-implementation ($n = 1$), early-implementation (months 1–6) ($n = 13$), late-implementation (months 7–12)($n = 7$). We made several ensuing rounds adaptions (eg, incorporating telemedicine, Supplemental Fig 6) and paused data collection for 3 to 6 months across sites (March 2020–September 2020).

Data Collection and Measurement

To measure intervention adherence, site providers and, rarely, site parents observed rounds in real-time for ≥3 patients per week per site using a previously developed rounds observation tool.[2,5,14] During the pandemic, some observations occurred virtually. Observers underwent video- and simulation-based training and rated key rounding aspects, including format (ie, rounding at bedside) (closed-ended); I-PASS component adherence (dichotomous); communication quality (4-point-Likert-extent-scale); nurse presence (4-point-categorical-scale), family and nurse engagement (5-point-behaviorally-anchored-scale); and teaching (dichotomous).

To measure safety climate and resident-reported harms, we surveyed resident-physicians at end-of-rotation (approximately every 2–4 weeks) and nurses and attending physicians at staff meetings. Staff provided completion-based-consent, completing surveys on paper or REDCap. For safety climate, we assessed select Agency for Healthcare Research and Quality Survey on Patient Safety Culture[25] 5-point-Likert-scale items, including working as a team (strongly disagree to strongly agree), staff freely speaking up (never to always), and safety grade (failing to excellent). Participants also reported minor or major harms (adverse events) caused by communication failures using items modified from prior studies.[14,21] Minor harms had limited clinical consequence (ie, requiring more frequent monitoring or transient discomfort, without prolonging hospitalization, significant organ dysfunction, or worsening clinical condition). Major harms had significant clinical consequence (ie, deteriorating clinical status, organ dysfunction, prolonged hospitalization, disability beyond discharge, death). We refined staff surveys using cognitive interviewing and piloting.

For patient and family experience, we surveyed 2 to 4 randomly selected Arabic, Chinese, English, or Spanish-speaking inpatients (≥13-years-old) or parents and caregivers ("families") weekly per site about safety climate, experience, and demographics. Families provided verbal consent with interpreters when necessary; patients ≥13-years-old provided assent. Patients and families self-completed paper (all 4 languages) or REDCap (English) surveys. Surveys included select 5-point Likert-scale Children's Hospital Safety Climate Questionnaire[26] items about speaking up, questioning decisions, and fear of asking questions (strongly disagree to strongly agree). They also included hospital experience items modified from prior research relating to how well doctors and nurses addressed concerns and made them feel part of the team (not at all to extremely).[14] They also completed Universal Health Literacy Precautions Toolkit items for language proficiency,[27] the 3-item screener for health literacy,[28] and self-reported demographics (including race and ethnicity). Surveys had a sixth grade Flesch-Kincaid reading level and underwent piloting and cognitive interviewing and professional translation into Arabic, simplified Chinese, and Spanish.

communication was structured through the I-PASS format, with Illness severity provided by the patient or family, Patient summary provided by the nurse and resident or advanced care provider, Action items and Situational awareness provided by the resident or advanced care provider, and Synthesis provided by the patient or family with input from nursing. Providers then completed a written summary of rounds (Rounds Report). The Mentored Implementation model, pioneered by the Society of Hospital Medicine, involves dedicated mentorship of each site by a mentor with expertise in the intervention. In our study, we modified Mentored Implementation to include a novel "Mentor-Trio" approach where each site was paired with a Mentor-Trio consisting of a parent, nurse, and physician mentor. Mentor-Trios met with Mentee-trios (parent, nurse, and physician champions) at each of the 21 sites monthly during the duration of the project to review stakeholder engagement, assess intervention adherence through review of monthly run charts, brainstorm potential plan-do-study-act cycles, and discuss intervention challenges and successes.

TABLE 1 Patient and Family Characteristics ($n = 2285$)

Characteristic	Overall, *N* (2285) (%)	Pre-implementation, *N* (619) (%)	Early-implementation, *N* (866) (%)	Late-implementation, *N* (800) (%)
Relationship to patient ($n = 2256$)				
Patient	155 (6.9)	46 (7.5)	61 (7.1)	48 (6.1)
Parent	2012 (89.2)	541 (88.3)	765 (89.6)	706 (89.5)
Grandparent	58 (2.6)	19 (3.1)	16 (1.9)	23 (2.9)
Other[a]	31 (1.4)	7 (1.1)	12 (1.4)	12 (1.5)
Age, y ($n = 2248$)				
<18	100 (4.4)	33 (5.4)	38 (4.5)	29 (3.7)
18–34	1081 (48.1)	299 (49.0)	422 (49.6)	360 (45.7)
35–54	1000 (44.5)	261 (42.8)	368 (43.2)	371 (47.1)
≥55	67 (3.0)	17 (2.8)	23 (2.7)	27 (3.4)
Gender ($n = 2230$)				
Female	1843 (82.6)	501 (82.3)	693 (82.2)	649 (83.4)
Male	387 (17.4)	108 (17.7)	150 (17.8)	129 (16.6)
Race and ethnicity ($n = 2238$)				
Asian, non-Hispanic	132 (5.9)	35 (5.8)	48 (5.7)	49 (6.2)
Black, non-Hispanic	314 (14.0)	81 (13.4)	110 (13.0)	123 (15.7)
Hispanic or Latino	515 (23.0)	142 (23.5)	195 (23.0)	178 (22.7)
White, non-Hispanic	1099 (49.1)	300 (49.7)	412 (48.5)	387 (49.3)
Other, non-Hispanic[b]	178 (8.0)	46 (7.6)	84 (9.9)	48 (6.1)
Language proficiency ($n = 2253$)				
Limited English proficiency (LEP)[c]	312 (13.8)	83 (13.7)	121 (14.1)	108 (13.7)
English proficient	1941 (86.2)	524 (86.3)	736 (85.9)	681 (86.3)
Language preferred by patients or families with LEP ($n = 312$)				
Arabic	2 (0.6)	1 (1.2)	1 (0.8)	0 (0)
Chinese	4 (1.3)	1 (1.2)	1 (0.8)	2 (1.9)
English	159 (51.0)	48 (57.8)	61 (50.4)	50 (46.3)
Portuguese	1 (0.3)	1 (1.2)	0 (0)	0 (0)
Spanish	121 (38.8)	29 (34.9)	45 (37.2)	47 (43.5)
Other[d]	14 (4.5)	3 (3.6)	8 (6.6)	3 (2.8)
Health literacy ($n = 2247$)				
Limited health literacy[e]	560 (24.9)	149 (24.6)	231 (27.1)	180 (22.8)
Adequate health literacy	1687 (75.1)	456 (75.4)	623 (73.0)	608 (77.2)
Education ($n = 2232$)				
No college	794 (35.6)	220 (36.5)	308 (36.5)	266 (33.8)
≥Some college	1438 (64.4)	383 (63.5)	535 (63.5)	520 (66.2)
Annual household income ($n = 2285$)				
<$14 999	285 (12.5)	71 (11.5)	112 (12.9)	102 (12.8)
$15 000–$49 999	747 (32.7)	225 (36.4)	276 (31.9)	246 (30.8)
$50 000–$99 999	540 (23.6)	138 (22.3)	200 (23.1)	202 (25.3)
≥$100 00	479 (21.0)	119 (19.2)	196 (22.6)	164 (20.5)
Missing	234 (10.2)	66 (10.7)	82 (9.5)	86 (10.8)

Patient and parent characteristics derived from self-reported survey data. Counts may not add up to column totals because of missing data (<3% missing except for annual household income). Patient and parent characteristics derived from self-reported survey data.

[a] Other relationship category includes 31 respondents who provided the following write-in categories: l/g($n = 1$); foster parent ($n = 4$); primo ($n = 1$); sister/primary caregiver ($n = 1$); cousin ($n = 2$); aunt, legal guardian ($n = 1$); aunt ($n = 2$); ant [sic] ($n = 1$); guardian ($n = 3$); uncle ($n = 1$); foster mom ($n = 2$); foster parent ($n = 1$); brother ($n = 1$); sister ($n = 4$); hermana ($n = 1$); girlfriend ($n = 1$); sister of patient ($n = 1$), guardian/caregiver ($n = 1$); 2 who did not further specify the "other" relationship.

[b] The "Other, non-Hispanic" category for race and ethnicity includes 69 respondents who selected more than 1 race: white and other ($n = 6$); Native Hawaiian/other Pacific Islander and other ($n = 1$); Native Hawaiian/other Pacific Islander and white ($n = 5$); Native Hawaiian/other Pacific Islander and white and other ($n = 1$); Black and other ($n = 2$); Black and white ($n = 17$); Black and white and other ($n = 1$); Black and Native Hawaiian/other Pacific Islander ($n = 1$); Asian and other ($n = 2$); Asian and white ($n = 4$); Asian and Native Hawaiian/other Pacific Islander ($n = 6$); Asian and Native Hawaiian/other Pacific Islander and other ($n = 1$); Asian and Native Hawaiian/other Pacific Islander and white ($n = 3$); Asian and Black ($n = 1$); American Indian or Alaskan Native and white ($n = 13$); American Indian or Alaskan Native and Native Hawaiian/other Pacific Islander ($n = 1$); American Indian or Alaskan Native and Black ($n = 1$); American Indian or Alaskan Native and Black and white ($n = 2$); American Indian or Alaskan Native and Asian and Black ($n = 1$). Forty four respondents also provided the following write-in categories: Middle Eastern ($n = 4$); from Middle East ($n = 1$); mixed (Indian/Black Jamaican) ($n = 1$); Arabian ($n = 1$); Arabic ($n = 2$); Samoan ($n = 2$); French Indian/German ($n = 1$); mix Hawaiian (?)[sic] ($n = 1$); India ($n = 1$); Ukrainian ($n = 1$), human ($n = 2$); multiracial ($n = 2$); Native Hawaiian ($n = 1$); Filipino ($n = 2$); Aboriginal American ($n = 1$), Pakistani ($n = 1$); Indian ($n = 2$); mixed ($n = 1$); Micronesian ($n = 1$); Latino ($n = 1$); Latina ($n = 1$); Hispanic ($n = 2$); Armenian ($n = 1$); Native ($n = 1$), Puerto Rican ($n = 1$); Jewish ($n = 1$); Phillipino [sic] ($n = 1$); everything – mix plate ($n = 1$); Moroccan ($n = 1$); Somali ($n = 2$); North African/Middle Eastern ($n = 1$); Samoans ($n = 1$); Indian, Black, and white ($n = 1$). The remainder of respondents selecting "other" did not further specify their race.

[c] Limited English proficiency was defined as responding anything other than "very well" to the question "how well do you speak English?" Response items ranged from very well, well, not well, to not at all. This item was taken from the Guide to Implementing the Health Literacy Universal Precautions Toolkit.[27]
[d] Other languages preferred by patients and families with LEP includes 14 respondents who provided the following write-in categories: American sign language ($n = 1$); Bengali ($n = 1$); Haitian Creole ($n = 1$); Hindi ($n = 1$); Polish ($n = 1$); Russian ($n = 2$); Somali ($n = 4$); Urdu ($n = 1$); and 2 who did not further specify the "other" language.
[e] Limited health literacy was defined as selecting a non-top-box answer for 1 or more of the following 3 questions: (1) "How often do you have someone (like a family member, friend, hospital/clinic worker, or caregiver) help you read hospital materials?" (non-top-box responses: all, most, some, or a little of the time); (2) "How often do you have problems learning about your medical condition because of difficulty understanding written information?" (non-top-box responses: all, most, some, or a little of the time); and (3) "How confident are you filling out forms by yourself?" (non-top-box responses: quite a bit, somewhat, a little bit, or not at all). This item was taken from the Chews 3-item screener.[28]

Outcomes

Our primary implementation outcome was adherence to all 5 I-PASS components on rounds (dichotomous). Our primary clinical-effectiveness outcome was overall resident-reported harm (major+minor) rates.[21] Secondary outcomes included top-2-box-rated safety climate and patient and family experience scores. ("top-2-box" = top-2 Likert-scale options, eg, strongly agree and agree). We defined implementation, clinical-effectiveness, service, and experience outcomes using implementation research standards.[29] Process outcomes included family engagement (top-2-box), nurse engagement (top-2-box), plain language (top-2-box), and teaching (dichotomous).

Analyses

We compared respondent sociodemographic characteristics by intervention time-period (pre vs early- vs late-implementation) using χ-square tests or Fisher's exact tests. We estimated adherence rates to key intervention elements for each implementation month (normalized to intervention go-live, not calendar-month) using mixed-effects logistic regression with random intercepts controlling for site-level clustering. These included individual I-PASS components (eg, illness severity) and composite outcomes (adherence to all I-PASS components). Interrupted-time-series[30] tested for intervention effect on linear trend over time of estimated monthly adherence rates.

TABLE 2 Resident Characteristics ($n = 1240$)

Characteristic	Overall, *N* (1240) (%)	Pre-implementation, *N* (363) (%)	Early-implementation, *N* (457) (%)	Late-implementation, *N* (420) (%)	*P*
Age, y ($n = 1221$)					.22
18–34	1155 (94.6)	336 (94.9)	425 (94.2)	394 (94.7)	
35–44	58 (4.8)	13 (3.7)	24 (5.3)	21 (5.1)	
≥45	8 (0.7)	5 (1.4)	2 (0.4)	1 (0.2)	
Gender ($n = 1225$)					.09
Female	826 (67.4)	240 (67.2)	307 (67.6)	279 (67.4)	
Male	352 (28.7)	109 (30.5)	127 (28.0)	116 (28.0)	
Other[a]	2 (0.2)	2 (0.6)	0 (0)	0 (0)	
Declined	45 (3.7)	6 (1.7)	20 (4.4)	19 (4.6)	
Race and ethnicity ($n = 1187$)					.80
Asian, non-Hispanic	221 (18.6)	62 (18.2)	76 (17.2)	83 (20.4)	
Black, non-Hispanic	72 (6.1)	21 (6.2)	23 (5.2)	28 (6.9)	
Hispanic or Latino	106 (8.9)	32 (9.4)	40 (9.1)	34 (8.4)	
White, non-Hispanic	675 (56.9)	192 (56.5)	261 (59.2)	222 (54.7)	
Other, non-Hispanic[b]	113 (9.5)	33 (9.7)	41 (9.3)	39 (9.6)	
Years of experience ($n = 1227$)					.16
<1 y	637 (51.9)	173 (48.5)	248 (54.9)	216 (51.7)	
1–5 y	586 (47.8)	184 (51.5)	201 (44.5)	201 (48.1)	
6–15 y	4 (0.3)	0 (0)	3 (0.7)	1 (0.2)	

Provider characteristics derived from self-reported survey data.
[a] The "other" category for gender includes 2 respondents who did not further specify their gender.
[b] The "other, non-Hispanic" category for race and ethnicity includes 48 respondents who selected more than 1 race: white and other ($n = 3$); Native Hawaiian/Pacific Islander and white ($n = 1$); Black and white ($n = 3$); Asian and other ($n = 1$); Asian and white ($n = 20$); Asian, white and other ($n = 1$); Asian and Native Hawaiian/Pacific Islander ($n = 2$); Asian, Black, and white ($n = 2$); American Indian/Alaskan Native and other ($n = 1$); American Indian/Alaskan Native and white ($n = 9$); American Indian/Alaskan Native and Black ($n = 2$); American Indian/Alaskan Native and Asian ($n = 1$); American Indian/Alaskan Native, Asian, Black, Native Hawaiian/Pacific Islander, and white ($n = 2$). Additionally, 65 respondents provided the following write-in categories for race and ethnicity: Arab ($n = 3$); Indian ($n = 1$); ME ($n = 1$); Middle Eastern ($n = 5$); mixed ($n = 1$); Pakistani ($n = 1$); South Asian ($n = 2$); N/A ($n = 1$); unknown ($n = 1$); if I answer this you will know who I am ($n = 1$); and I don't think it's appropriate to ask about race ($n = 1$). The remainder of respondents selecting "other" did not further specify their race and ethnicity.

We used mixed-effects Poisson regression to estimate resident-reported harm rates, testing for changes over time via tests for linear trend over time-periods.

For safety climate and experience, we dichotomized the sample into participants with and without top-2-box scores (4–5 vs 1–3 of 5). We examined bivariate associations between having top-2-box scores and intervention time-period using mixed-effects logistic regression and tested for trends over time. We adjusted top-2-box staff safety climate scores for characteristics varying across time-periods.

We explored whether the intervention's effect on key outcomes in the late-implementation period differed by hospital size (number of pediatric staffed beds), family engagement, nurse engagement, or adherence to all I-PASS components. We dichotomized hospital size, family engagement, nurse engagement, and adherence by median hospital values for each characteristic. To test for effect-modification of hospital characteristics, we evaluated differences in trends in outcomes over time by hospital characteristic by including an interaction-term between the characteristic and time-period in regression models. Statistical significance was achieved with a 2-sided P value $<.05$. We used REDCap[31] for data collection and management and SAS v9.4 (SAS Institute) for analyses.

RESULTS

Participant Characteristics

We conducted 4457 rounds observations, and received surveys from 2285 patients and families, 1240 resident-physicians, 819 nurses, and 378 attending-physicians. Survey response rates were 72.8%, 50.6%, 33.1%, and 41.7%, respectively (53.0% overall). Most patient and family participants were parents (89.2%), female (82.6%), 18 to 34 years-old (48.1%), had some college (64.4%), and an income <$50 000 per year (45.2%). The most common race and ethnicity was white non-Hispanic (49.1%), followed by Hispanic (23.0%), and Black non-Hispanic (14.0%); 13.8% of respondents had limited English proficiency and 24.9% had limited health literacy. Patient and family characteristics did not differ significantly between implementation periods. Staff were predominantly resident-physicians (50.9%), female (75.4%), 18 to 34 years-old (69.2%), white non-Hispanic (65.0%), and in practice 1 to 5 years (40.2%). Staff role, gender, age, and years in practice significantly varied by implementation-period (Table 1-4).

Intervention Adherence

At the time of intervention, the proportion of observations demonstrating bedside rounding with families significantly improved (from 76.5% to 89.5%), as did adherence to all 5 I-PASS components on rounds (25.5% to 60.8%). Particularly

TABLE 3 Attending Characteristics (n = 378)

Characteristic	Overall, n (378) (%)	Pre-implementation, N (194) (%)	Early-implementation, N (74) (%)	Late-implementation, N (110) (%)	P
Age, y (n = 375)					.01
18–34	89 (23.7)	50 (26.0)	13 (17.8)	26 (23.6)	
35–44	184 (49.1)	100 (52.1)	28 (38.4)	56 (50.9)	
45–74	102 (27.2)	42 (21.9)	32 (43.8)	28 (25.5)	
Gender (n = 374)					.24
Female	241 (64.4)	131 (68.6)	40 (54.8)	70 (63.6)	
Male	122 (32.6)	56 (29.3)	29 (39.7)	37 (33.6)	
Declined	11 (2.9)	4 (2.1)	4 (5.5)	3 (2.7)	
Race and ethnicity (n = 370)					.86
Asian, non-Hispanic	74 (20.0)	34 (18.1)	18 (24.7)	22 (20.2)	
Black, non-Hispanic	17 (4.6)	11 (5.9)	3 (4.1)	3 (2.8)	
Hispanic or Latino	21 (5.7)	12 (6.4)	4 (5.5)	5 (4.6)	
White, non-Hispanic	228 (61.6)	117 (62.2)	41 (56.2)	70 (64.2)	
Other, non-Hispanic[a]	30 (8.1)	14 (7.5)	7 (9.6)	9 (8.3)	
Years of experience (n = 375)					.19
<1 y	7 (1.9)	5 (2.6)	0 (0)	2 (1.8)	
1–5 y	86 (22.9)	48 (25.0)	10 (13.7)	28 (25.5)	
6–15 y	189 (50.4)	95 (49.5)	38 (52.1)	56 (50.9)	
≥16 y	93 (24.8)	44 (22.9)	25 (34.3)	24 (21.8)	

Provider characteristics derived from self-reported survey data.

[a] The "other, non-Hispanic" category for race and ethnicity includes 14 respondents who selected more than 1 race: white and other (n = 1); Black and white (n = 1); Asian and white (n = 7); and American Indian/Alaskan Native and white (n = 5). Additionally, 4 respondents provided the following write-in categories: Brown (n = 1); Indian (n = 1); and Middle Eastern (n = 2). The remainder of respondents selecting "other" did not further specify their race and ethnicity.

TABLE 4 Nurse Characteristics (n = 819)

Characteristic	Overall, *N* (819) (%)	Pre-implementation, *N* (410) (%)	Early-implementation, *N* (174) (%)	Late-implementation, *N* (235) (%)	*P*
Age, y (n = 800)					<.0001
18–34	413 (51.6)	193 (48.0)	119 (68.8)	101 (44.9)	
35–44	181 (22.6)	96 (23.9)	24 (13.9)	61 (27.1)	
45–74	206 (25.8)	113 (28.1)	30 (17.3)	63 (28.0)	
Gender (n = 803)					.26
Female	746 (92.9)	375 (93.5)	158 (91.3)	213 (93.0)	
Male	38 (4.73)	16 (4.0)	13 (7.5)	9 (3.9)	
Declined	19 (2.4)	10 (2.5)	2 (1.2)	7 (3.1)	
Race and ethnicity (n = 794)					<.001
Asian, non-Hispanic	46 (5.8)	35 (8.8)	1 (0.6)	10 (4.4)	
Black, non-Hispanic	28 (3.5)	13 (3.3)	3 (1.8)	12 (5.3)	
Hispanic or Latino	36 (4.5)	21 (5.3)	3 (1.8)	12 (5.3)	
White, non-Hispanic	623 (78.5)	296 (74.6)	151 (88.3)	176 (77.9)	
Other, non-Hispanic[a]	61 (7.6)	32 (8.0)	13 (7.6)	16 (7.1)	
Years of experience (n = 807)					< .0001
<1 y	70 (8.7)	28 (6.9)	32 (18.5)	10 (4.4)	
1–5 y	293 (36.3)	143 (35.3)	81 (46.8)	69 (30.1)	
6–15 y	242 (30.0)	127 (31.4)	32 (18.5)	83 (36.2)	
≥16 y	202 (25.0)	107 (26.4)	28 (16.2)	67 (29.3)	

Provider characteristics derived from self-reported survey data.

[a] The "other, non-Hispanic" category for race and ethnicity includes 40 respondents who selected more than 1 race: white and other (n = 1); Native Hawaiian/Pacific Islander and white (n = 2); Asian and white (n = 9); Asian and Native Hawaiian/Pacific Islander (n = 3); American Indian/Alaskan Native and other (n = 1); American Indian/Alaskan Native and white (n = 23); Asian, Native Hawaiian/Pacific Islander, and white (n = 1). Additionally, 4 respondents provided the following write-in categories: East Indian (n = 1); Korean (n = 1); not relevant (n = 1); and unspecified (n = 1). The remainder of respondents selecting "other" did not further specify their race and ethnicity.

strong improvements were seen in Illness severity (65.8% to 95.4%) and Synthesis by receiver (53.6% to 84.1%). Immediate improvements in written rounds summary (29.8% to 72.4%), family engagement (70.9% to 87.6%), nurse engagement (33.4% to 63.0%), and plain language (50.2% to 60.6%) also occurred, all $P < .05$. Except for written summary, improvements sustained during early- and late-implementation (Fig 2). Observed trainee teaching did not change by implementation period.

Harms

Resident-reported overall, minor, and major harms were unchanged by implementation-period (Fig 3, Supplemental Table 5). However, there were differential decreases in overall harms in larger-sized hospitals and hospitals with greater nurse engagement and I-PASS adherence, compared with their counterparts. In larger hospitals, overall harms per 1000-resident days fell from 116.9 to 86.3 to 72.3 ($P = .006$), a 38.2% reduction. In smaller hospitals, harms were unchanged: 74.9 to 88.8 to 86.4 ($P = .85$). There was a significant differential change in harms by hospital size ($P = .03$). In hospitals with greater nurse engagement, overall harms fell from 110.6 to 73.3 to 65.3 ($P < .001$), a 41.0% reduction. In hospitals with lesser nurse engagement, harms were unchanged: 80.0 to 102.8 to 93.9 ($P = .39$). There was a significant differential change in harms by nurse engagement ($P < .001$). In hospitals with higher adherence to I-PASS structure, overall harms fell from 95.3 to 73.6 to 72.3 ($P < .05$), a 24.1% reduction. In hospitals with lower adherence to I-PASS structure, harms were unchanged: 91.8 to 100.6 to 85.9 ($P = .62$). There was no significant differential change in harms by I-PASS adherence ($P = .26$).

Safety Climate

Adjusted top-2-box staff safety climate scores significantly improved pre- vs early- vs late-implementation for all 12 items ($P < .05$), including working together as a team (90.4% to 93.1% to 94.4%), staff freely speaking up (83.1% to 84.5% to 89.0%), and overall safety grade (80.5% to 86.3% to 88.0% excellent or very good) (Fig 4). Staff safety grade improved in smaller hospitals (74.6% to 86.2% to 87.8%, $P < .001$), but not in larger hospitals (86.2% to 86.0% to 88.1%, $P = .44$) ($P = .02$ for difference by size) (Supplemental Fig 7).

Top-2-box patient and family safety climate scores for overall safety grade remained unchanged, though ratings for staff are afraid to ask questions (never or rarely [reverse-coded]) went from 68.0% to 72.0% to 73.2% ($P = .06$) (overall ratings in Supplemental Fig 8; ratings by provider type in Supplemental Fig 9).

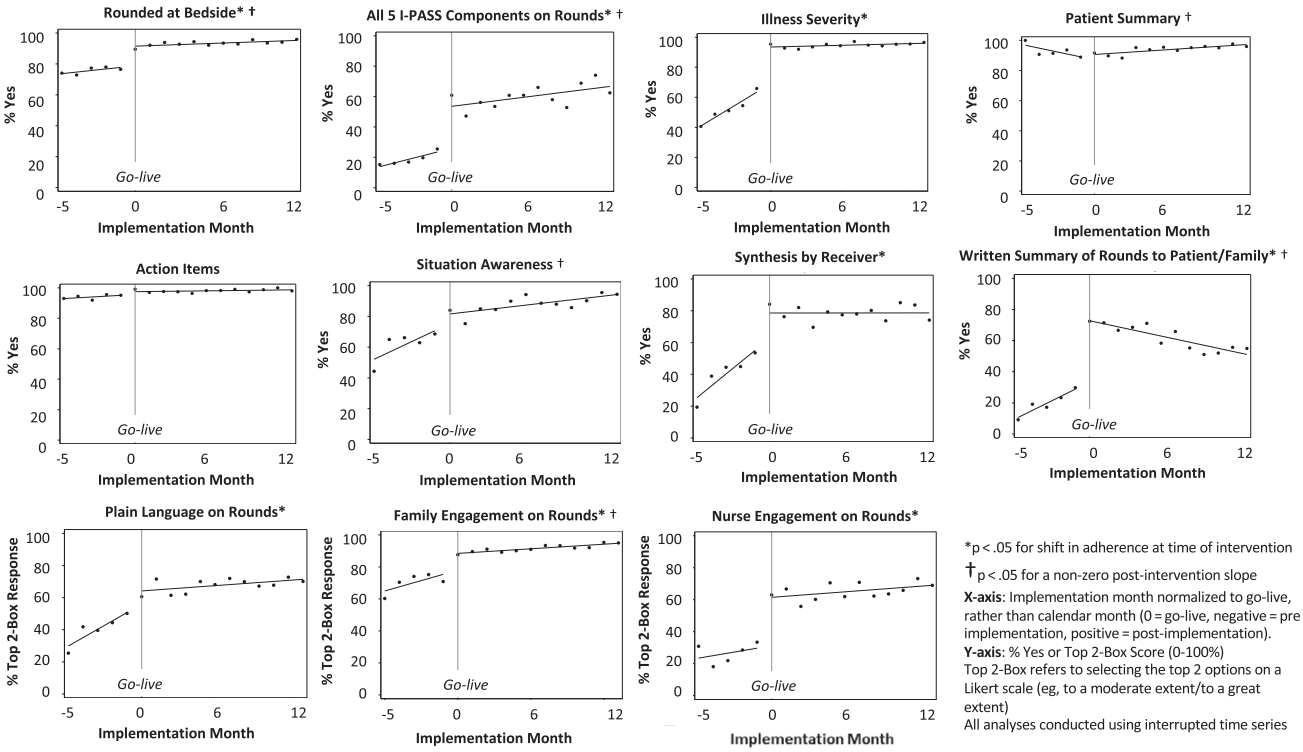


FIGURE 2
Adherence to key PFC I-PASS intervention elements by implementation month.

Experience

Top-2-box patient and family experience did not significantly change by implementation-period (Supplemental Table 6). However, top-2-box patient and family experience for nurses making you feel part of the team improved for larger hospitals (90.4% to 93.2% to 95.1%, $P = .02$) versus smaller hospitals (96.8% to 95.7% to 94.8%, $P = .19$) ($P = .01$ for difference by size).

DISCUSSION

In this 21-center hybrid-effectiveness-implementation study, a novel parent-nurse-physician Mentor-Trio implementation strategy was associated with sustained high adherence to core PFC I-PASS components. Tests of "real-world" effectiveness of PFC I-PASS showed that resident-reported patient harms improved for larger-sized hospitals and those with greater PFC I-PASS adherence and nurse engagement. Staff safety climate improved, without negatively affecting patient and family experience or trainee teaching. Our findings indicate that the coproduced Mentor-Trio strategy was a promising strategy to implement PFC I-PASS on a larger scale and in more diverse contexts. Our study also provides further evidence about feasibility and effectiveness of structured PFCR in diverse settings and the value of authentic partnership between patients and families, nurses, and physicians in successfully implementing complex hospital-based QI interventions.

Our novel implementation approach for PFCR, in which parents, nurses, and physicians led together, was feasible and well-received, even during a global pandemic, when many hospitals limited PFCR and bedside caregivers.[32–34] Our study demonstrates how family partnership can be accomplished virtually (not just in-person), allowing family coinvestigators to more easily participate in hospital-based projects. Coproduction between patients and families, clinicians, and hospitals is important[24] but underutilized, particularly in QI efforts. Our Mentor-Trio approach, which embraces coproduction principles called for by the Institute for Patient and Family-Centered Care and American Academy of Pediatrics,[3,7,8] can be applied to other projects. By authentically involving physicians, nurses, and patients and families together rather than utilizing siloed QI efforts, hospitals may more successfully implement interventions. Nursing and parent participation in Mentor-Trios also helped address nursing-specific and family-specific implementation challenges (eg, nursing bedside presence, family perceptions of trainee redirection on rounds).

Robust studies examining PFCR implementation are lacking: most are single-site QI projects.[11] Our findings and prior research show that adherence to complex I-PASS-structured communication interventions during resident handoffs[2,35]

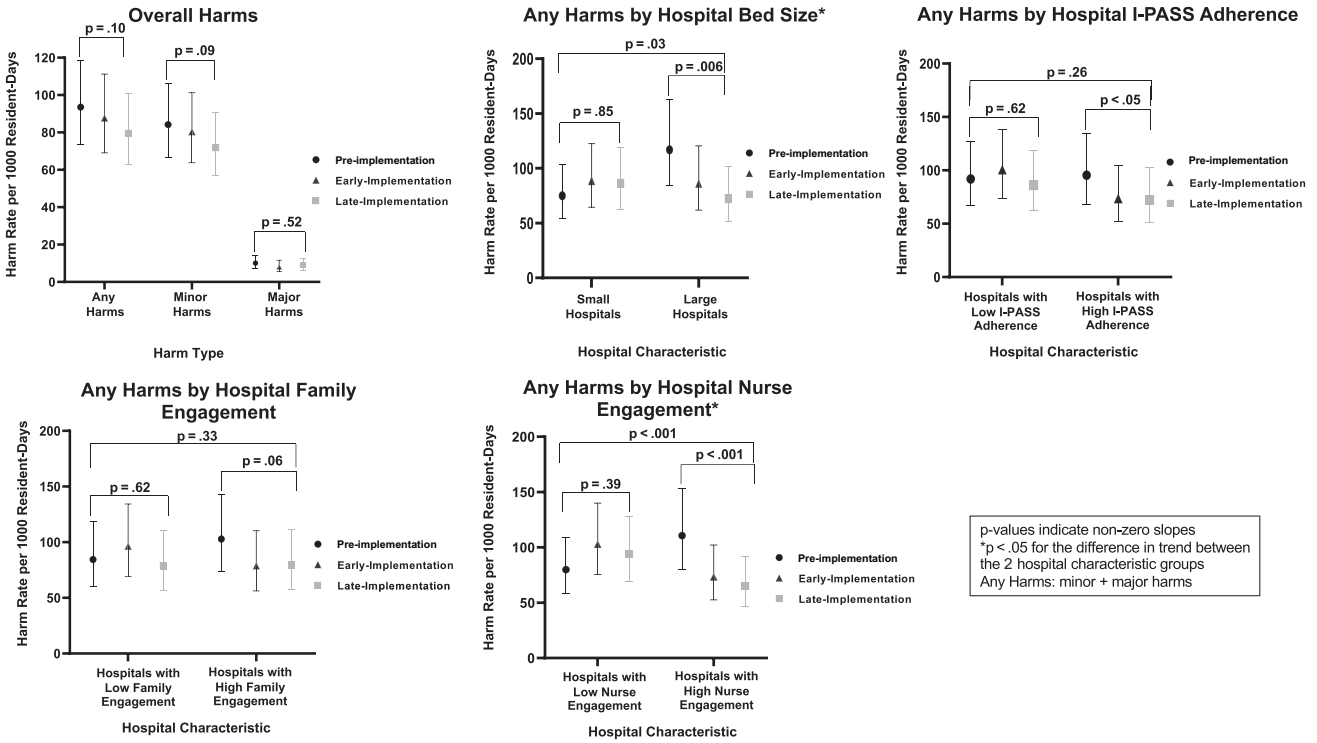


FIGURE 3

Resident-reported harms by implementation time period, overall and by hospital characteristics.

and PFCR[14] is possible. Compared with the prior 7-center PFC I-PASS Study, adherence to PFC I-PASS components, like synthesis by receiver (teach-back), a health literacy best-practice that improves outcomes, was higher in the current study.[36] This may be because of several modifications to the intervention, including use of the Mentor-Trio model, and better training about teach-back. The growing evidence-base around PFC I-PASS may also have contributed, as providers may be more willing to implement interventions with a stronger evidence-base. Harms improved more in hospitals with better nurse engagement and patient and family experience with nursing improved in larger hospitals; this result is consistent with prior research showing structured communication interventions with modest nursing investments significantly improve nursing-related measures.[14,37,38] Indeed, nurse engagement in QI efforts is crucial in promoting hospital safety and quality.[39–41]

We again found no decrease in resident teaching, a balancing measure and common criticism of PFCR.[6,13] Although this study did not measure rounds duration and results of other PFCR studies vary,[11] our 7-center study found no increase in rounding duration with PFC I-PASS.[14] Ensuring all team members, including nurses and families, are present and engaged in rounds can promote shared understanding and save time[12] by obviating downstream clarifications and streamlining communication throughout the day.

Our findings differ somewhat from our 7-center study, in which harmful errors decreased overall post-implementation.[14] The resident-reported, communication-related harms effectiveness measure in this study is less sensitive than the intensive systematic safety surveillance measure in the prior study, but was chosen as a more practical, real-world alternative. The lack of overall harm improvement in this study may be because of decreased measure sensitivity, or differential effectiveness of the intervention across different centers or situations where nurse engagement, intervention adherence, or other unmeasured factors vary. We also may have been underpowered to detect more subtle improvements in harms. Additionally, COVID-19 may have adversely affected safety,[42–45] further confounding findings. That staff safety climate improved post-implementation across centers is promising, as safety climate is associated with directly measured safety outcomes.[46–48] Given provider burnout[49–51] after COVID-19, improving safety climate is important in its own right.

We observed no improvements in patient and family experience post-implementation. However, hospital experience was high at baseline. Additionally, our intervention focused on communication structure, not other aspects of interpersonal communication like trust-building, which may influence experience. Although patient and family experience did not improve, it did not worsen post-implementation, despite the pandemic; it is possible (though unknown) that the

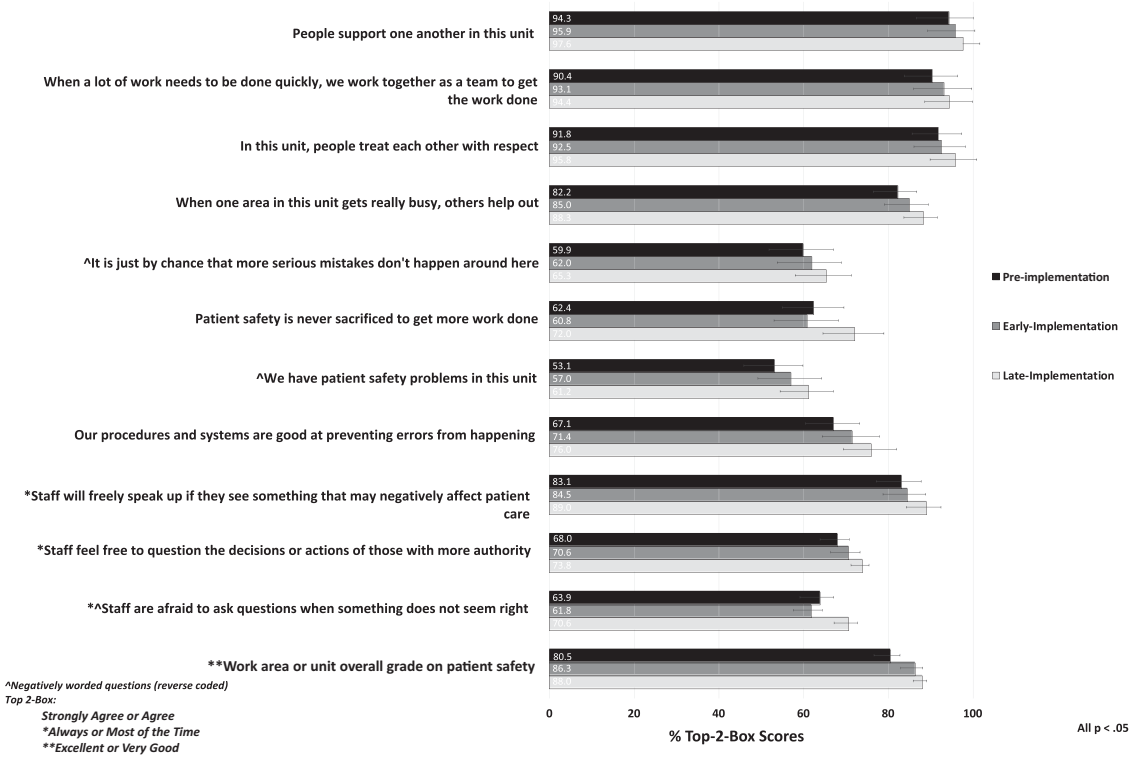


FIGURE 4
Staff safety climate (% top-2-box).

intervention might have mitigated a pandemic-driven deterioration in patient and family experience.[32,52,53]

Operationalizing effective PFCR interventions requires support from front-line staff and leaders, key elements of our implementation process. Barriers to nursing PFCR involvement exist, like competing time-demands (eg, 8 AM medications).[11,12] Frontline nursing and leadership support and nurse-centric PFCR workflow changes may be needed (eg, rounding by nursing assignment, notifying nurses of rounds 1 to 2 patients in advance).

Our study had limitations. Our design—appropriate for a hybrid effectiveness-implementation study—limits conclusions about causality. However, our interrupted-time-series design strengthens rigor of analyses compared with simple pre and post designs and our study remains one of the most robust PFCR studies. Although this study provides evidence supporting broad PFC I-PASS implementation, we focused on teaching hospitals' pediatric services. Additional research is required to determine whether PFC I-PASS generalizes to other specialties or hospital types. Although we surveyed Arabic, Chinese, and Spanish-speakers, patients speaking less common languages may have different experiences. Similarly, in our study (and, sadly, much of medicine), physicians' and nurses' racial and ethnic composition was different than patients'. Hospital experience and other outcomes might be improved with a more diverse physician and nursing workforce with greater patient-provider racial and ethnic concordance.[54,55] This is an important area for future study by our study group and the field. Rounds observations were primarily conducted by physician observers, so may have been subject to bias. Measurement of resident-reported harms was incomplete and potentially subject to reporting and social desirability bias but pragmatic based on study resources and the desire to more closely mimic usual operational conditions in data collection; similar resident-reported harm measures have been used successfully previously.[21] COVID-19 may have confounded findings because of provider burnout, patient experience, and staffing; if so, our intervention might have been more beneficial than the current study suggests. Although we made strides in family and nurse engagement, further improvement in nursing engagement on rounds is required, perhaps by understanding attitudes, beliefs, and competing demands.[12] Finally, we may have been underpowered to detect differences in harms, patient and family safety climate, and experience, and a ceiling effect may have existed with the latter 2. Future work should study nurse engagement as well as PFCR disparities and best practices for patients speaking other languages (an ongoing focus of our study group), adults, and subspecialties.

CONCLUSIONS

A novel Mentor-Trio modification of mentored implementation was an effective strategy to implement PFC I-PASS in pediatric inpatient units. This larger-scale implementation was associated with significant improvements in provider and patient and family communication processes and safety climate. Additionally, in larger hospitals and hospitals with better nursing engagement and adherence to PFC I-PASS structure, PFC I-PASS was associated with reductions in resident-reported harms. The current intervention was successful in diverse teaching hospital settings despite the challenges of a global pandemic. Our findings suggest that hospitals should better engage patients and families and nurses at the bedside during rounds. Doing so can improve patient safety, safety climate, and patient and family and staff engagement, increasing self-efficacy, coproduction,[24] and family-centeredness. Lastly, our findings provide evidence that coproduction of QI efforts by patients and families, nurses, and physicians working as a team can drive sustained transformational changes in hospitals.

APPENDIX 1 PATIENT AND FAMILY CENTERED I-PASS SCORE STUDY GROUP AUTHOR AFFILIATIONS

In addition to all co-authors named in the byline (Khan, Patel, Anderson, Baird, Johnson, Liss, Graham, Calaman, Fegley, Goldstein, O'Toole, Rosenbluth, Alminde, Bass, Bismilla, Caruth, Coghlan-McDonald, Cray, Destino, Dreyer, Everhart, Good, Guiot, Haskell, Hepps, Knighton, Kocolas, Kuzma, Lewis, Litterer, Kruvand, Markle, Micalizzi, Patel, Rogers, Subramony, Vara, Yin, Sectish, Srivastava, Starmer, West, Spector, Landrigan), the Patient and Family Centered I-PASS SCORE Study Group includes the following group authors: Erin Abu-Rish Blakeney, PhD, RN[a]; Bridget Allard, DO[b,c]; Karla J. AuYeung, MD[d]; Kathleen Bartlett, MD[e]; Angela Byrd, MD[f]; Tim Capecchi, MD[g]; Cynthia Castiglioni, MD, MS[h,i]; Weijen Chang, MD[j]; Marco Costilla, MSN, RN, CPN[k]; Jeff Cousins, BA[l]; Ebony Cunningham, MPH, RN, CPN[m] Mike Daly, BA[n]; Sarah F. Denniston, MD[o,p]; Carla Dyer, MD[q]; Jonathan S. Farkas, MD[r,s]; Shaun Fitzgerald, MD, MPH[t]; Morgan Foster, MSN, RN[u]; Anna Gary, MD[v]; Marquita Genies, MD, MPH[w]; Alexander F. Glick, MD, MS[s,x]; Laura Hagemeyer, MD[g]; David J. Hall, MD[y]; Jennifer Hall, MD[v]; Nathalee Harris, RN, BSN[z]; Rohini Harvey, MD[j]; Erin Hauck, MD[f]; Marie Haugen, RN[aa]; Vicky Holman, MBA, RNC[bb]; Helen Hughes, MD, MPH[w]; W. Charles Huskins, MD, MSc[y]; Satoko Igarashi, MD[j]; Ashley Joshi-Patel, DO[cc]; Evdoxia Gloria Karagounis, MSN, RN, CPN[m,n,dd]; Mikelle Key-Solle, MD[e]; Jennifer Kleven, MD, MPH, FAAP[aa,ee]; Erin Knoebel, MD, MPH[y]; Jessica Kosut, MD, FAAP[b,c]; Shannon Koty, MSN, CPN, CPHON[ff]; Shawnice Kraeber, MD[t]; Jeffrey Lancaster, MD[gg]; Lauren Lay, MSN, RN, CPN[hh,ii]; Tracie Major, DNP, APRN-CNS, CPN[jj]; Janet Manegold[kk]; Angie Marin, MSN, RN-C[ll]; Jordan Marmet, MD[g]; Christine Marrese, MD[j]; David Marseille, MD[dd]; Meghan E. McClure, MD[cc]; Stacy McConkey, MD[mm]; Sue Mead, MS[nn]; Heidi Nolen, BSN, RN[oo]; Lauran Odom, RN, BSN,CPN[m]; Jenna Pellowski, MSN, RN, CNL[aa,pp]; Timothy Porter, MD[o,p,qq]; Heather Rayburn, MHA, BSN, RN[rr]; Stefanie Reed, DO, FAAP[dd,ss]; Melissa Reichenbach, MSN, RN, C-PNP, CRRN[kk]; Gwendolyn Reyes, MD[tt]; Manda Robinson, BSN, RN, CPN[uu]; Eileen Romano, DNP, MBA, RN[vv]; Melissa Roy, MD[f]; Jennifer P. Rubin, MD[h,i]; Andrew Saxon, MD[t,ww]; Gretchen Schwindt, RN, MSN[xx]; Rina Shah, MD[t]; Mahesh Sharman, MD[tt]; Erin E. Shaughnessy, MD, MSHCM[yy]; Carmela E. Sosa, MD, FAAP[zz,aaa]; Hannah B. Stevenson, BSN, RN[bbb]; Chickajajur S.Vijay, MD[ff,gg]; Rick Visconte, MSN, RN[o]; Eric Volz-Benoit, RN[ccc]; Jillian Wall, MD, MPH[v]; Nicole Webb, MD[ddd]; Sharon Welsch, BSN, RN, LCN[eee,fff]; Mary Ann Westcott, BSN, RN, CNML[ggg]; Jessica Witkowski, MD[hhh]; Natalie Woodward, MS[f]; and Clifton Yu, MD, FAAP[iii,jjj]

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ABBREVIATIONS

I-PASS: Illness severity-Patient summary-Action items-Situational awareness-Synthesis by receiver
LEP: limited English proficiency
PFC I-PASS: Patient and Family Centered I-PASS
PFCR: patient/family-centered rounds
QI: quality improvement

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REFERENCES

1. The Joint Commission. Sentinel event statistics released for 2014. Available at: www.jointcommission.org/assets/1/23/jconline_April_29_15.pdf. Accessed August 19, 2021
2. Starmer AJ, Spector ND, Srivastava R, et al; I-PASS Study Group. Changes in medical errors after implementation of a handoff program. *N Engl J Med*. 2014;371(19):1803–1812
3. Committee on Hospital Care and Institute For Patient- And Family-Centered Care. Patient- and family-centered care and the pediatrician's role. *Pediatrics*. 2012;129(2):394–404
4. Mittal V. Family-centered rounds. *Pediatr Clin North Am*. 2014;61(4):663–670
5. Destino LA, Shah SS, Good B. Family-centered rounds: past, present, and future. *Pediatr Clin North Am*. 2019;66(4):827–837
6. Rappaport DI, Ketterer TA, Nilforoshan V, Sharif I. Family-centered rounds: views of families, nurses, trainees, and attending physicians. *Clin Pediatr (Phila)*. 2012;51(3):260–266
7. American Academy of Pediatrics. Positioning the family and patient at the center. a guide to family and patient partnership in the medical home. Available at: https://www.pcpcc.org/resource/positioning-family-and-patient-center. Accessed June 28, 2017
8. Committee on Hospital Care. American Academy of Pediatrics. Family-centered care and the pediatrician's role. *Pediatrics*. 2003;112(3 Pt 1):691–697
9. Ahmed A, Chu D, Wang S. Current caregiver perspectives and effects of demographics on family-centered rounds. *Clin Pediatr (Phila)*. 2018;57(6):694–699
10. Ju A, Sedano S, Mackin K, Koh J, Lakshmanan A, Wu S. Variation in Family involvement on rounds between English-speaking and Spanish-speaking families. *Hosp Pediatr*. 2022;12(2):132–142
11. Knighton AJ, Bass EJ. Implementing family-centered rounds in hospital pediatric settings: a scoping review. *Hosp Pediatr*. 2021;11(7):679–691
12. Knighton AJ, Bass EJ, McLaurin EJ, et al. Intervention, individual, and contextual determinants to high adherence to structured family-centered rounds: a national multi-site mixed methods study. *Implement Sci Commun*. 2022;3(1):74
13. Paul TK. Questioning family-centered rounds: a pediatric resident's challenge. *J Grad Med Educ*. 2020;12(3):247–249
14. Khan A, Spector ND, Baird JD, et al. Patient safety after implementation of a coproduced family centered communication programme: multicenter before and after intervention study. *BMJ*. 2018;363:k4764
15. Lewis KD, Destino L, Everhart J, et al. Patient and family-centered I-PASS SCORE program: resident and advanced care provider training materials. *MedEdPORTAL*. 2022;18:11267
16. Shojania KG, Grimshaw JM. Evidence-based quality improvement: the state of the science. *Health Aff (Millwood)*. 2005;24(1):138–150
17. Curran GM, Bauer M, Mittman B, Pyne JM, Stetler C. Effectiveness-implementation hybrid designs: combining elements of clinical effectiveness and implementation research to enhance public health impact. *Med Care*. 2012;50(3):217–226
18. Calaman S, Spector ND, Starmer AJ, et al. I-PASS handoff curriculum: computer module. *MedEdPORTAL*. 2013;9:9337
19. O'Toole J, Calaman, S, Anderson, M, et al. Utilizing co-production to improve patient-centeredness and engagement in healthcare delivery: lessons from the patient and family-centered I-PASS studies. *J Hosp Med*. 2023;18(9):848–852
20. Maynard GA, Budnitz TL, Nickel WK, et al; Innovation in Patient Safety and Quality at the National Level. 2011 John M. Eisenberg Patient Safety and Quality Awards. Mentored implementation: building leaders and achieving results through a collaborative improvement model. Innovation in patient safety and quality at the national level. *Jt Comm J Qual Patient Saf*. 2012;38(7):301–310
21. Starmer AJ, Spector ND, O'Toole JK, et al. Implementation of the I-PASS handoff program in diverse clinical environments: a multicenter prospective effectiveness implementation study. *J Hosp Med*. 2023;18(1):5–14
22. Rogers KM, Childers DJ, Messler J, Nolan A, Nickel WK, Maynard GA. Glycemic control mentored implementation: creating a national network of shared information. *Jt Comm J Qual Patient Saf*. 2014;40(3):111–118
23. Jenkins I, O'Bryan T, Holdych J, Maynard G. Impact of a multicenter, mentored quality collaborative on hospital-associated venous thromboembolism. *J Hosp Med*. 2018;13(7):462–469
24. Batalden P, Foster T. From assurance to coproduction: a century of improving the quality of health-care service. *Int J Qual Health Care*. 2021;33(Supplement_2):ii10–ii14
25. Agency for Healthcare Research and Quality. AHRQ hospital survey on patient safety culture. Available at: https://www.ahrq.gov/sops/surveys/hospital/index.html. Accessed December 30, 2021
26. Cox ED. Children's hospital safety climate questionnaire. Available at: https://www.hipxchange.org/CHSCQ. Accessed December 28, 2021
27. Agency for Healthcare Research and Quality. Guide to implementing the health literacy universal precautions toolkit. Available at: https://www.ahrq.gov/health-literacy/quality-resources/tools/literacy-toolkit/impguide/index.html. Accessed August 4, 2021

28. Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med.* 2004;36(8):588–594

29. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health.* 2011;38(2): 65–76

30. Mullan PC, Scott S, Chamberlain JM, et al. Decreasing blood culture contaminants in a pediatric emergency department: an interrupted time series analysis. *Pediatr Qual Saf.* 2018; 3(5):e104

31. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42(2): 377–381

32. Drapeaux A, Jenson JA, Fustino N. The Impact of COVID-19 on patient experience within a Midwest hospital system: a case study. *J Patient Exp.* 2021;8:23743735211065298

33. Craddock KES, Grilo S, McCann TA, Catallozzi M, Banker SL. Physician perspectives on the impact of the COVID-19 pandemic on family-centered rounds [published online ahead of print on Dec 1, 2021]. *Hosp Pediatr.* doi:10.1542/hpeds.2021-006004

34. Jaswaney R, Davis A, Cadigan RJ, et al. Hospital policies during COVID-19: an analysis of visitor restrictions. *J Public Health Manag Pract.* 2022;28(1):E299–E306

35. Starmer AJ, Sectish TC, Simon DW, et al. Rates of medical errors and preventable adverse events among hospitalized children following implementation of a resident handoff bundle. *JAMA.* 2013;310(21):2262–2270

36. Ha Dinh TT, Bonner A, Clark R, Ramsbotham J, Hines S. The effectiveness of the teach-back method on adherence and self-management in health education for people with chronic disease: a systematic review. *JBI Database Syst Rev Implement Reports.* 2016;14(1):210–247

37. Khan A, Rogers JE, Forster CS, Furtak SL, Schuster MA, Landrigan CP. Communication and shared understanding between parents and resident-physicians at night. *Hosp Pediatr.* 2016;6(6):319–329

38. Khan A, Baird J, Rogers JE, et al. Parent and provider experience and shared understanding after a family-centered nighttime communication intervention. *Acad Pediatr.* 2017;17(4):389–402

39. Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. *Nurs Res.* 1998;47(1):43–50

40. Needleman J, Buerhaus P. Nurse staffing and patient safety: current knowledge and implications for action. *Int J Qual Health Care.* 2003;15(4):275–277

41. Cho H, Steege LM. Nurse fatigue and nurse, patient safety, and organizational outcomes: a systematic review. *West J Nurs Res.* 2021;43(12):1157–1168

42. Bergman L, Falk AC, Wolf A, Larsson IM. Registered nurses' experiences of working in the intensive care unit during the COVID-19 pandemic. *Nurs Crit Care.* 2021;26(6):467–475

43. Fournier JP, Amélineau JB, Hild S, et al. Patient-safety incidents during COVID-19 health crisis in France: an exploratory sequential multi-method study in primary care. *Eur J Gen Pract.* 2021;27(1):142–151

44. Haidari E, Main EK, Cui X, et al. Maternal and neonatal health care worker well-being and patient safety climate amid the COVID-19 pandemic. *J Perinatol.* 2021;41(5):961–969

45. Masonbrink AR, Harris M, Hall M, et al. Safety events in children's hospitals during the COVID-19 pandemic. *Hosp Pediatr.* 2021; 11(6):e95–e100

46. Singer S, Lin S, Falwell A, Gaba D, Baker L. Relationship of safety climate and safety performance in hospitals. *Health Serv Res.* 2009;44(2 Pt 1):399–421

47. Smith SA, Yount N, Sorra J. Exploring relationships between hospital patient safety culture and Consumer Reports safety scores. *BMC Health Serv Res.* 2017;17(1):143

48. Mardon RE, Khanna K, Sorra J, Dyer N, Famolaro T. Exploring relationships between hospital patient safety culture and adverse events. *J Patient Saf.* 2010;6(4):226–232

49. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Intern Med.* 2012;172(18):1377–1385

50. Profit J, Sharek PJ, Amspoker AB, et al. Burnout in the NICU setting and its relation to safety culture. *BMJ Qual Saf.* 2014; 23(10):806–813

51. de Lima Garcia C, Bezerra IMP, Ramos JLS, do Valle JETMR, Bezerra de Oliveira ML, Abreu LC. Association between culture of patient safety and burnout in pediatric hospitals. *PLoS One.* 2019;14(6):e0218756

52. Millstein JH, Kindt S. Reimagining the patient experience during the Covid-19 pandemic. Available at: https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0349. Accessed May 19, 2022

53. Patient Engagement HIT. How did the COVID-19 pandemic affect patient satisfaction levels?. Available at: https://patientengagementhit.com/news/how-did-the-covid-19-pandemic-affect-patient-satisfaction-levels. Accessed May 19, 2022

54. Shen MJ, Peterson EB, Costas-Muñiz R, et al. The Effects of race and racial concordance on patient-physician communication: a systematic review of the literature. *J Racial Ethn Health Disparities.* 2018;5(1):117–140

55. Takeshita J, Wang S, Loren AW, et al. Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA Netw Open.* 2020;3(11):e2024583