X + Y Scheduling in Pediatric Residency: Continuity, Handoffs, and Trainee Experience

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ABSTRACT

BACKGROUND: Many internal medicine residency programs have transitioned to an X + Y clinic schedule, in which weekly continuity clinics are removed and clinic experience is instead condensed into 2-week blocks interspersed throughout the year, but few pediatric training programs have adopted this approach. We initiated X + Y scheduling in the 2015 academic year, with the hypothesis that outpatient continuity could be maintained or improved while inpatient handoffs would be reduced. We also hypothesized that learner experience with X + Y scheduling would be positive.

METHODS: Continuity and handoffs were compared over a 7-month period in 2013 to 2014 and 2015 to 2016. Outpatient continuity was calculated as the proportion of visits in which the patient was seen by the designated primary care provider (PCP). Handoffs were calculated through analysis of the online resident schedule with comparison of weekly totals for all inpatient teams. Resident perceptions were obtained in an online survey of residents who experienced both systems.

RESULTS: With X + Y scheduling, overall outpatient continuity improved from 2914 of 9882 (29.5%) of visits seen by a patient's PCP to 3066 of 9769 (31.4%) ($P = .004$), but preventive visit continuity decreased from 2170 of 4687 (46.2%) to 2025 of 4709 (43%) ($P = .001$). Inpatient handoffs decreased with X + Y scheduling from 30 to 20 weekly handoffs ($P < .001$). In total, 85% of residents reported a positive experience with X + Y scheduling.

CONCLUSIONS: An X + Y scheduling approach in pediatrics is a viable alternative to weekly clinics, resulting in improved learner experience, reductions in inpatient handoffs, and small mixed effects on outpatient continuity.

KEYWORDS: continuity clinic; inpatient hand-offs; resident education

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WHAT'S NEW

This is the first published data on the effect of outpatient continuity, inpatient handoffs, and learner experience in a pediatric residency program transitioning to immersive inpatient and outpatient experiences in lieu of weekly continuity clinics.

DUTY-HOUR RESTRICTIONS MANDATED by the Accreditation Council on Graduate Medical Education in 2003 and 2011[1,2] resulted in a disruption of the weekly primary care experience and a sharp increase in inpatient handoffs for trainees.[3,4] Improved continuity of care, defined here as the proportion of visits in which patients are seen by their primary care physician, is associated with improved outcomes, just as increased inpatient handoffs are associated with increased patient safety events.[4-12] The Internal Medicine Resident Review Committee (RRC) recognized the unintended impact of duty-hour restrictions on patient care and resident education[13] and called for innovation to reduce the conflict between inpatient and outpatient duties.[2,14] In response, many internal medicine programs adopted a practice of X + Y scheduling in which outpatient primary care experiences are condensed from one half-day weekly to concentrated blocks of 1 or 2 weeks throughout the year, with mixed effects on patient continuity.[5,15-18] Most pediatric residency programs have not transitioned to this X + Y scheduling approach in which inpatient and outpatient clinical experiences are separated, although the traditional model of a standing weekly clinic has resulted in limited continuity with previously reported rates ranging from 25% to 63%.[3,5,19]

Primary care is rightfully a cornerstone of pediatric graduate medical education, but removing residents from demanding inpatient rotations and expecting them to

immediately shift their focus to a rigorous half-day primary care session can significantly undermine the continuous provider−patient relationship in both inpatient and outpatient pediatrics.[5,8,14,20] In addition, this scheduling method does not mirror typical outpatient practice. In an effort to increase resident exposure to realistic outpatient practice, as well as to improve both inpatient and outpatient provider−patient continuity, our residency program introduced an X + Y schedule in lieu of the traditional model of weekly half-day clinics. We compared a measure of outpatient continuity, number of inpatient handoffs, and resident perceptions of patient care and education before and after introduction of X + Y scheduling.

METHODS

In the 2015 to 2016 academic year, the Yale New Haven Children's Hospital Pediatric Residency Program adopted an X + Y schedule for all levels of residents (60 categorical residents in total, 20 per postgraduate year). We created schedule templates using variably spaced, 4-week blocks of inpatient or intensive care unit months interspersed with 2-week clinic blocks and elective experiences. In both the traditional model as well as X + Y, clinics were scheduled for both morning and afternoon sessions. Occasional continuity clinics during an inpatient rotation remained in individual resident schedules as necessary to maintain the RRC requirement to have continuity clinic scheduled over 26 separate calendar weeks (Fig. 1). All outpatient continuity clinics are housed in our pediatric primary care center, where both supervised resident physicians and advanced practice providers see pediatric patients for preventive and acute visits. This clinic serves 97% Medicaid patients and has a volume of approximately 18,000 visits annually.

We compared rates of continuity for a period before X + Y scheduling, the 7-month period between September 1, 2013, to March 31, 2014 (preintervention), and for the same 7-month period of the 2015 to 2016 academic year after X + Y scheduling (postintervention). The 2014 to 2015 academic year was excluded from analysis, since during this time a substantial subset of residents completed their continuity experience at a satellite clinic, with vastly different resident-scheduling processes. We calculated patient-centered continuity rates using the proportion of completed patient visits that were seen by the designated resident primary care provider (PCP) in the electronic health record. We calculated outpatient continuity rates by resident as the proportion of resident-completed encounters in which the resident was the given patient's primary care provider. To best capture individual residents' experience with X + Y scheduling, we calculated individual continuity rates for each resident during the preintervention period and compared these 60 individual continuity rates with the 60 continuity rates during the after-intervention period. All visits were included in the overall continuity analysis, and we subsequently examined the subset of well-child care visits (identified by diagnostic codes).

We examined inpatient hand-offs (number of instances in which a group of patients was handed off from one resident to another) via analysis of the online resident scheduling software, calculating the number of handoffs using typical resident-staffing patterns. Three hand-offs occurred on weekdays (morning, "short call," and overnight) and 2 hand-offs occurred on weekends and holidays (morning and overnight). Any outpatient clinics scheduled for residents rotating on inpatient units added 1 hand-off to the daily hand-off tally, unless 2 members of the same inpatient team had concurrent clinics, in which case only one additional hand-off was included in the tally. Variables were analyzed by chi-square for categorical items and by unpaired *t*-test for continuous variables. All statistics were computed using Microsoft Excel (Redmond, Wash).

We surveyed resident physicians who had participated in both systems of scheduling (postgraduate year 3 physicians in 2015−2016 and 2016−2017) regarding their perceptions of patient care and education. Using a retrospective pre-post survey design, we sent a series of questions previously used for house-staff in the validated Learners Perception Survey[21] to all 40 residents who experienced both traditional and X + Y scheduling. We administered the survey using an anonymous electronic survey link (Qualtrics Software, Provo, Utah). We analyzed survey answers using descriptive statistics alone, reporting percentage of neutral responses defined as "no difference," along with positive responses defined as "more satisfied" and "much more satisfied" and negative responses as "less satisfied" and "much less satisfied." This study was granted an exemption by the Yale University institutional review board.

RESULTS

CONTINUITY AND HAND-OFFS

In examining continuity from the patient perspective, in the preintervention period, 2914 of 9882 (29.5%) of all visits were completed by the patient's primary care provider, compared with 3066 of 9769 (31.4%) of all visits in the postintervention period ($P = .004$). In the preintervention period 2170 of 4687 (46.2%) of well-child visits were completed by the patient's listed PCP compared with 2025 of 4709 (43.0%) in the postintervention period ($P = .001$). There were 20 resident physicians whose continuity data were included in both time periods.

There was no statistical difference between the overall number of outpatient visits completed by residents between the 2 periods (121 visits/resident preintervention vs 131 visits/resident postintervention; $P = .34$) or the number of well child visits (60 visits/resident preintervention vs 64 visits/resident postintervention; $P = .21$). Of note, residents in the preintervention period had an average of 35 clinic half-days scheduled, of which 29% were completed on a rotation seeing only acute visits in an open access schedule approach. In the postintervention period, residents had on average 41 half-days of clinic, all of which consisted of well-child care interspersed with acute visits and chronic care follow-up visits ($P = .003$).

Block	PGY 1	PGY 2	PGY 3
1a	Elective *(2 clinics)*	Emergency Department *(2 clinics)*	Elective *(2-3 clinics)*
1b	Clinic – Development *(6 clinics)*	Emergency Department *(2 clinics)*	Elective *(2-3 clinics)*
2a	PICU *(0 clinics)*	Elective *(2-3 clinics)*	Inpatient Rotation *(0 clinics)*
2b	PICU *(0 clinics)*	Elective *(2-3 clinics)*	Inpatient Rotation *(0 clinics)*
3a	Vacation	NICU *(0 clinics)*	Clinic *(12-16 clinics)*
3b	Nursery – Clinic *(6 clinics)*	Clinic *(12-16 clinics)*	Vacation
4a	Emergency Department *(2 clinics)*	Inpatient Rotation *(0 clinics)*	Emergency Department *(2 clinics)*
4b	Emergency Department *(2 clinics)*	Inpatient Rotation *(0 clinics)*	Emergency Department *(2 clinics)*
5a	Clinic *(12-16 clinics)*	Elective *(2-3 clinics)*	Inpatient Rotation *(0 clinics)*
5b	Night Float *(0 clinics)*	Clinic *(12-16 clinics)*	Inpatient Rotation *(0 clinics)*
6a	Inpatient Rotation *(0 clinics)*	NICU *(0 clinics)*	Inpatient Rotation *(0 clinics)*
6b	Inpatient Rotation *(0 clinics)*	NICU *(0 clinics)*	Inpatient Rotation *(0 clinics)*
7a	Vacation	Inpatient Rotation *(0 clinics)*	Elective *(2-3 clinics)*
7b	Nursery – Clinic *(6 clinics)*	Inpatient Rotation *(0 clinics)*	Clinic *(12-16 clinics)*
8a	Inpatient Rotation *(0 clinics)*	Vacation	Inpatient Rotation *(0 clinics)*
8b	Inpatient Rotation *(0 clinics)*	Clinic *(12-16 clinics)*	Inpatient Rotation *(0 clinics)*
9a	Inpatient Rotation *(0 clinics)*	PICU *(0 clinics)*	Elective *(2-3 clinic sessions)*
9b	Clinic *(12-16 clinics)*	PICU *(0 clinics)*	Elective *(2-3 clinics)*
10a	Inpatient Rotation *(1 clinics)*	Inpatient Rotation *(0 clinics)*	Vacation
10b	Inpatient Rotation *(1 clinics)*	Inpatient Rotation *(0 clinics)*	Clinic *(12-16 clinics)*
11a	Inpatient Rotation *(0 clinics)*	Elective *(2-3 clinics)*	Elective *(2-3 clinics)*
11b	Inpatient Rotation *(0 clinics)*	Clinic *(12-16 clinics)*	Elective *(2-3 clinics)*
12a	Night float *(0 clinics)*	Inpatient Rotation *(0 clinics)*	Elective *(2-3 clinics)*
12b	Clinic – Development *(9 clinics)*	Inpatient Rotation *(0 clinics)*	Elective *(2-3 clinics)*
13a	NICU *(0 clinics)*	Vacation	Clinic *(12-16 clinics)*
13b	NICU *(0 clinics)*	Clinic *(12-16 clinics)*	Elective *(2-3 clinics)*

Figure 1. *Sample postgraduate year (PGY)1, PGY2, and PGY3 schedules using immersion approach.*

During the preintervention period, on average 36% of a given resident's visits came from a patient in their primary panel, compared with 39% of visits in the postintervention period ($P = .31$). In a subanalysis of preventative visits, during the preintervention period 48% of a given resident's well-child visits were patients in their primary panel, compared with 45% of preventive care visits in the post-intervention period ($P = .11$).

With regards to inpatient handoff data, in the preintervention period there were, on average, 29.6 handoffs total

per week for the 3 inpatient (non-intensive care unit) provider teams combined. In the postintervention period there were, on average, 19.8 handoffs total per week for the 3 inpatient provider teams combined ($P < .001$).

LEARNER PERCEPTIONS

In all, 27 of 40 residents completed the survey (response rate 67%); 13 of 27 respondents graduated residency in 2016 and 14 of 27 in 2017. All Likert responses are summarized in Figure 2. Of the 324 resident responses regarding inpatient experience (12 queried items with 27 resident participants), 63% (203/324) of responses indicated more satisfaction with the X + Y model, compared with 4% (12/324) of responses indicating less satisfaction, and 33% (109/324) of responses indicating no difference between the 2 systems. The largest areas of improvement were in "ability to provide safe inpatient care" and "time for inpatient learning," in which 85% of resident respondents reported more or much more satisfaction with the X + Y model. In the outpatient section of the survey, 50% (162/324) of responses indicated more satisfaction compared with 9% (29/324) of responses indicating less satisfaction and 41% (133/324) indicating neutral response. Sixty-seven percent of resident respondents reported increased satisfaction with "preparation for outpatient clinical practice," and 59% indicated increased satisfaction with "time for outpatient learning" and "overall ownership of patient care." The largest area of negative responses recorded was in outpatient level of job stress and outpatient level of fatigue, in which 5 of 27 (19%) reported less or much less satisfaction with X + Y. Overall a majority of residents reported an improvement in these areas, with 51% reporting more or much more satisfaction with both their outpatient level of fatigue and job stress, and 55% and 71% reporting improvement in their inpatient level of fatigue and job stress respectively.

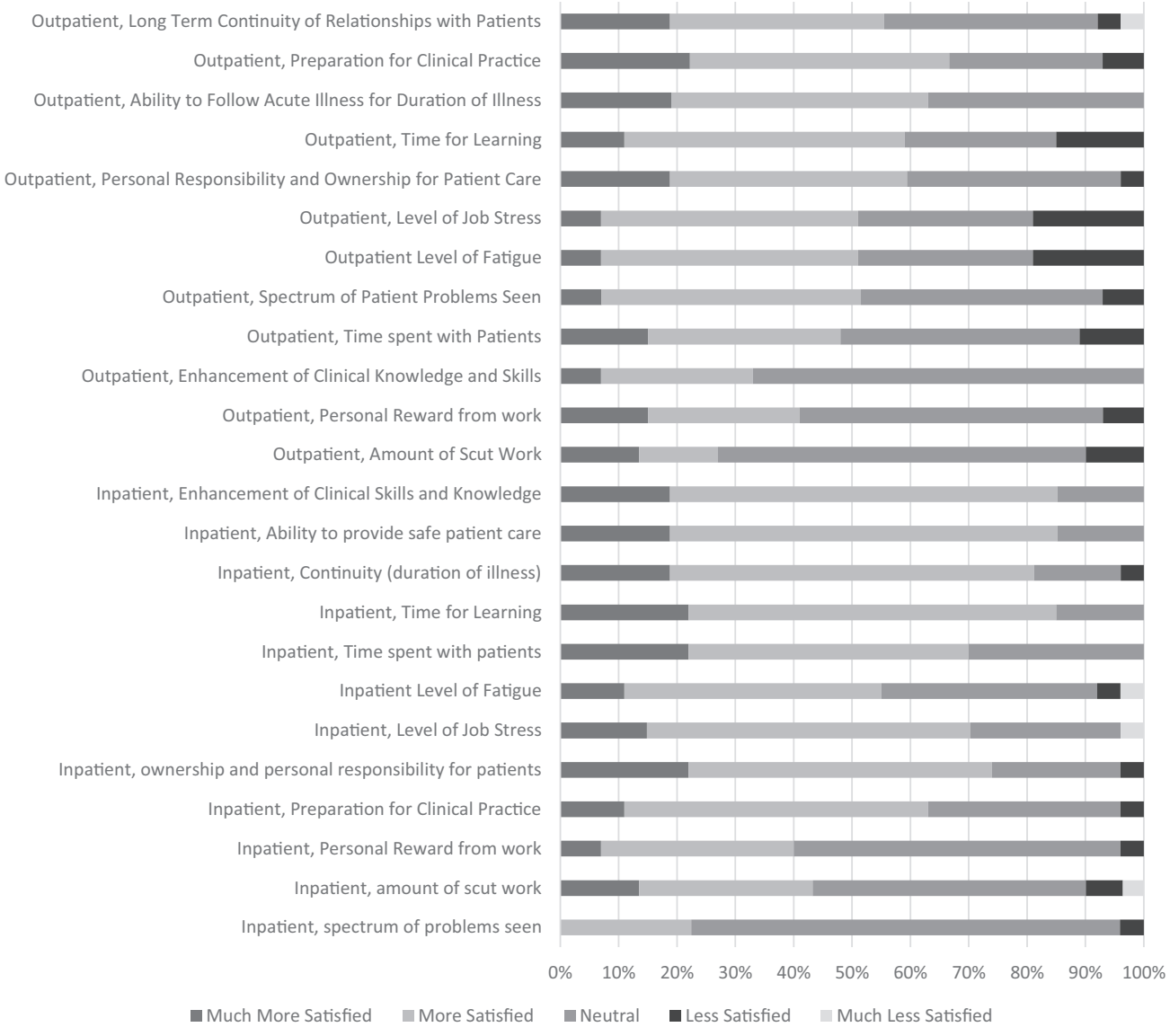

Figure 2. *Survey results.*

DISCUSSION

In the era of resident duty-hour restrictions, the balance between inpatient and outpatient education and clinical responsibility has become increasingly complex.[3] When a resident cannot be reliably scheduled for clinic at a recurring weekly session because of a variety of evening and night shifts, scheduling appointments with a resident PCP is challenging, and patient continuity is necessarily reduced. Internal medicine training programs have responded to this challenge by moving away from the traditional weekly clinic model into one of a number of alternative X + Y scheduling approaches.[15-18] To our knowledge, this is the first published report examining the effects of such a model on pediatric continuity and education.

The overall rate of patient−provider continuity increased in our study. The changes were small but statistically significant. One possible explanation for these results is an increase in provider availability for primary patients' acute care needs. In the X + Y model, short-term continuity, such as for an asthma exacerbation seen for care on several days in a row, could be provided by one resident, possibly that patient's PCP. Residents noted this change, with a majority of respondents indicating improved preparation for outpatient clinical practice and improved ownership of patient care. Non-visit continuity activities, such as following up laboratory results and answering patient questions via phone calls, are another critical feature of preparation for outpatient clinical practice and patient ownership. Although we were unable to capture these types of activity in our study, there are data from studies in internal medicine that X + Y scheduling increases resident follow-up of laboratory results from their primary patient panel.[16]

In the subanalysis of well-child visits, there was a decrease in patient continuity, potentially as a result of residents being away from the clinic for 4 to 8 weeks at any given time. Particularly because this was a new model, there was likely less flexibility at the scheduling level in the timing of well-child visits (for example, by failing to schedule an infant's 4-month visit at 4.5 months of age to allow the infant's PCP to be present for the visit during her or his next clinic block). Such inflexibility may have resulted in patients/parents scheduling with another provider for convenience or to stay "on schedule." It is possible that with additional years of experience with X + Y scheduling, increased flexibility in timing of follow-up visits, along with other innovations within this approach, may improve well-child continuity. Some internal medicine programs also have used team-based primary care as a complement to X + Y scheduling, with overall improved continuity.[17,18]

The impact of X +Y scheduling on the inpatient setting was pronounced, with a significant decrease in inpatient handoffs, which not only take time away from direct patient care, but also are a leading source of adverse events in hospitals.[4,7,8,10,11] Although we did not track adverse inpatient events, most resident respondents indicated improved satisfaction with the safety of inpatient care. Furthermore, the time recovered with the elimination of handoffs may have provided residents on inpatient teams increased opportunity for both direct patient care and learning.

Although the majority of learners (24/27) reported an overall positive experience with X + Y, it is important to note that 3 of 27 learners surveyed reported a negative experience. These 3 learners accounted for >60% of our overall negative responses, including the categories of outpatient level of stress and fatigue. Although in the minority, the experience of these learners must be considered and balanced against the experience of the majority. One hypothesis is that condensing the clinic experience for learners who do not enjoy clinic (or the inpatient experience for learners who dislike hospital medicine) may increase temporary periods of dissatisfaction. Future research into X + Y scheduling could explore the experience of learners in both systems to identify sources of dissatisfaction for a minority of learners and create possible adaptations.

Our study has a number of strengths. Although overall primary care continuity remains an area in need of improvement, the marked reduction in inpatient handoffs balanced with neutral to slightly improved overall outpatient continuity suggest this schedule is a feasible alternative to the traditional weekly model. Importantly, a large majority of residents in our study found X + Y scheduling to be better for learning and for patient care. Wellness and work-life balance remain challenging for residency programs, and X + Y scheduling resulted in a decrease in overall job stress and fatigue for more than one half of residents who responded to the survey.

Our study also has some limitations. Notably, although the effects on continuity were statistically significant, the impact on overall trainee education and patient care from this small change is likely quite limited. Our overall low outpatient continuity rates remain an area of opportunity for our institution and may limit the generalizability of our results. In addition, with a retrospective pre-post design for the survey, we can only assume association and not causation; residents were a year further along in training and some improvement in overall perception of residency likely comes with the end of a grueling intern year. This study design also leaves us at significant risk of recall bias. Our response rate was only 67% despite 2 reminder e-mails encouraging participation, but we did see a good representation of both classes of residents involved. We also were not able to capture other types of non-visit continuity (eg, telephonic follow-up of results) or directly observe handoff frequency and duration. We also do not have data on the experience of faculty or patients during this transition.

CONCLUSIONS

X + Y scheduling is still relatively new to graduate medical education and rare in pediatrics where continuity of care is an appropriate emphasis. Our study illustrates

that the effect of X + Y scheduling on outpatient continuity is modest and mixed, but the effect on inpatient handoffs is large and positive. Learner experience with this model was largely positive in both inpatient and outpatient spheres. Maintaining the pediatric RRC requirement for spreading continuity clinic over 26 calendar weeks is a particular operational challenge that many centers may encounter, but we hope additional programs will consider a transition to this model allowing for more in-depth studies of resident experience and continuity of care with both approaches.

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