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The Best of Both Worlds: Strengthening Medical Education Research and Evaluation Using Quality Improvement

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In 2016, pediatric hospital medicine (PHM) was recognized as a subspecialty by the American Board of Medical Specialties (ABMS) with emphasis on the roles of hospitalists as educators and experts in systems-based improvement.[1–3] Nationally, pediatric hospitalists have diverse non-clinical professional responsibilities, with medical education and quality improvement (QI) being the most common.[4,5] An underrecognized area of scholarship within PHM can be described as educational quality improvement (EQI): a rigorous approach to the implementation and evaluation of educational interventions using QI frameworks and methodologies.[6] Here we describe opportunities and benefits of the intentional incorporation/integration of QI methodology into medical education research, highlighting the article by Bauer et al[7] in the June issue of *Hospital Pediatrics*, as well as relevant examples from the literature demonstrating EQI best practices to guide the rigorous development and evaluation of educational projects of potential interest to pediatric hospitalists.

A literature search of Ovid Medline using the keywords "plan do study act (PDSA)" and "medical education" over the past decade yielded roughly 60 publications, most of which were published in 2018 or after. The clinical contexts and problems for which interventions occurred varied from medical, surgical, pediatric and adult specialties, with target groups of faculty, students, residents and fellows. Projects focused on a range of goals, from improving procedural competence,[8] handoffs,[9] patient flow,[10] preparation for internship[11] and reporting of patient safety incidents.[12] However, after careful review of each project's methods, fewer than 20% of these publications applied QI methods to achieve predetermined educational objectives.

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High-quality medical education and QI interventions both emphasize adaptable, action-oriented collaborative learning to improve clinical practice and patient outcomes. Iterative improvement is required in both fields to address the changing needs of individuals and teams working in complex clinical environments with multiple stakeholders. Addressing gaps in medical education and clinical care often cannot wait for the results of blinded large randomized controlled trials (RCTs) to be published. In many instances, randomization and blinding are neither feasible nor ethical[13] and effectiveness may be established without an RCT. Overlap of commonly used frameworks such as the Model for Improvement[14] and Kern's model for curriculum development[15] emphasizes careful description of the problem(s) being addressed before embarking on the intervention, structured approaches to understanding the processes through which changes occur, and continuous reassessment while the intervention is underway to identify further areas for improvement.

A common methodological issue that contributes to lack of rigor within medical education research and impedes successful publication is the pretest-posttest study design. Unfortunately, multiple meta-analyses[16] have shown that the majority of medical education studies utilized a pretest–posttest study design. A comparison between two cross-sections in time often provides the benefits of ease and statistical power to detect a change; however, medical education interventions are rarely static and this approach risks drawing premature conclusions about the impact of an intervention without the benefit of seeing trends over time.[17] Tracking outcomes over time is fundamental to QI and preferred to pre/post assessments, to allow more accurate conclusions to be drawn about impact and sustainability. Rigorous evaluation of medical education interventions may also be constrained by lack of a guiding framework, small sample

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sizes, convenience sampling, and concurrent interventions. These limitations may introduce bias, obscure disparities in outcomes among learners and thus limit generalizability. Given that medical education RCTs are relatively rare compared to clinical research RCTs, adapting QI methods provides a way to strengthen educational studies without introducing additional constraints.

In the June issue of *Hospital Pediatrics*, Bauer et al[7] conducted a study titled "Letting Residents Lead: Implementing Resident Admission Triage Call Curriculum and Practice." The authors sought to increase resident involvement in overnight admission calls from the emergency department (ED) to determine appropriate patient placement. Prior to this intervention, hospitalist attendings were the ones who were involved in these admission triage decisions. What was particularly impactful about this medical education research project was that the authors evaluated the impact of their educational curriculum, which they called their admission triage curriculum (ATC), using QI methodology. The primary outcome measure was the frequency of resident participation in joint and independent triage calls. Secondary outcomes included self-perceived confidence, satisfaction with the overnight rotation, and ED efficacy. Their balancing measure was assessed by asking the daytime hospitalist who assumed care of the patient to determine the appropriateness of care, triage placement, and safety concerns with yes/no responses to monitor safety. Impressively, the proportion of joint calls between a resident and ED increased from 7% to 88% from project start to completion, respectively, and was sustained above 60% over a 21-month period. In addition, residents reported significant increases in adequacy of triage training and self-confidence in three triage skills and there were no complications or safety concerns for patients admitted by residents.

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What best practices for EQI exist to guide educators who would like to incorporate QI frameworks and methods in their curricular work? Four key actions in EQI study design, based on our literature review, are highlighted in Table 1 with demonstrative examples. These 4 key actions are by no means exhaustive, meant to replace collaboration and consultation with medical education and QI experts, or a review of published resources for scholarship such as SQUIRE-EDU[18] which highlights important items authors should consider when applying QI methods to medical education studies. We recommend intentionally incorporating these key actions and SQUIRE-EDU guidelines into the planning stages of an EQI project so that interventions and measurable aims can be clearly defined up front and more useful results can be captured over time, all of which are more likely to lead to successful scholarship and publication.

This commentary highlights how existing frameworks within QI can be integrated into medical education research to bring greater validity and strength to data collection and analysis. Medical education and QI share an openness to iterative improvement and learning by doing. By more intentionally merging approaches from these two fields, the dynamic relationship between testing interventions and learning from them can be more rigorously described and disseminated.

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References

1. Ottolini MC. Pediatric hospitalists and medical education. *Pediatr Ann*. 2014;43(7). doi:10.3928/00904481-20140619-08
2. Heydarian C, Maniscalco J. Pediatric hospitalists in medical education: Current roles and future directions. *Curr Probl Pediatr Adolesc Health Care*. 2012;42(5):120-126. doi:10.1016/j.cppeds.2012.01.003
3. Barrett DJ, Mcguinness GA, Cunha CA, Jean S. Pediatric Hospital Medicine : A Proposed New Subspecialty. *Pediatrics*. 2017;139(3). doi:10.1542/peds.2016-1823
4. Freed GL. Pediatric Hospitalists: Training, Current Practice, and Career Goals. *J Hosp Med*. 2009;4(3):179-186. doi:10.1002/jhm.458
5. Leyenaar JK, Capra LA, Brien ERO, Leslie LK, Mackie TI. Determinants of Career Satisfaction Among Pediatric Hospitalists : A Qualitative Exploration. *Acad Pediatr*. 2014;14(4):361-368. doi:10.1016/j.acap.2014.03.015
6. Rooholamini S, Starr S, Hayward K, Colson E, Smith S. Using Quality Improvement Concepts to Improve Educational Curricula. In: Morgenstern B, Horak H, Konopasek L, et al., eds. *Alliance for Clinical Education Guidebook for Clerkship Directors.* 5th ed. Gegensatz Press; 2019.
7. Bauer SC, et al. Letting Residents Lead: Implementing Resident Admission Triage Call Curriculum and Practice. Hosp Pediatr. 2021; doi: 10.1542/hpeds.2020-005199
8. Chen JX, Kozin E, Bohnen J, et al. Assessments of Otolaryngology Resident Operative Experiences Using Mobile Technology: A Pilot Study. *Otolaryngol - Head Neck Surg (United States)*. 2019;161(6):939-945. doi:10.1177/0194599819868165
9. Cardona VQ, Labadie A, Cooperberg DB, Zubrow A, Touch SM. Improving the neonatal team handoff process in a level IV NICU: Reducing interruptions and handoff duration. *BMJ Open Qual*. 2021;10(1). doi:10.1136/bmjoq-2020-001014
10. Kouo T, Kleinman K, Fujii-Rios H, et al. A resident-led QI initiative to improve pediatric emergency department boarding times. *Pediatrics*. 2020;145(6). doi:10.1542/peds.2019-1477
11. Monday LM, Gaynier A, Berschback M, et al. Outcomes of an Online Virtual Boot Camp to Prepare Fourth-Year Medical Students for a Successful Transition to Internship. *Cureus*. Published online 2020. doi:10.7759/cureus.8558
12. Dunbar AE, Cupit M, Vath RJ, et al. An improvement approach to integrate teaching teams in the reporting of safety events. *Pediatrics*. 2017;139(2). doi:10.1542/peds.2015-3807
13. Colli A, Pagliaro L, Duca P. The ethical problem of randomization. *Intern Emerg Med*. 2014;9(7):799-804. doi:10.1007/s11739-014-1118-z
14. Langley G, Nolan K, Nolan T, Norman C, Provost L. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. 2nd ed. Jossey-Bass Publishers; 2009.
15. Kern D, Thomas P, Hughes MT. *Curriculum Development for Medical Education: A Six-Step Approach*. Third. The Johns Hopkins University Press; 2016.
16. Cook DA. If you teach them, they will learn: Why medical education needs comparative effectiveness research. *Adv Heal Sci Educ*. 2012;17(3):305-310. doi:10.1007/s10459-012-9381-0
17. Brady PW, Tchou MJ, Ambroggio L, Schondelmeyer AC, Shaughnessy EE. Quality improvement feature series article 2: Displaying and analyzing quality improvement data.

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J Pediatric Infect Dis Soc. 2018;7(2):100-103. doi:10.1093/jpids/pix077
18. Ogrinc G, Armstrong GE, Dolansky MA, Singh MK, Davies L. SQUIRE-EDU (Standards for Quality Improvement Reporting Excellence in Education): Publication Guidelines for Educational Improvement. *Acad Med*. 2019;94(10):1461-1470. doi:10.1097/ACM.0000000000002750
19. Handley SC, Pouppirt N, Zucker E, Coughlin KA. Improving the Resident Educational Experience in a Level IV Neonatal / Infant Intensive Care Unit. 5(6):1-7. doi:10.1097/pq9.0000000000000352
20. Patel A, Unaka N, Holland D, et al. Increasing Physical Exam Teaching on Family-Centered Rounds Utilizing a Web-Based Tool. *Pediatr Qual Saf*. 2017;2(4):e032. doi:10.1097/pq9.0000000000000032
21. Byrd AS, McMahon PM, Vath RJ, Bolton M, Roy M. Integration of Mobile Devices to Facilitate Patient Care and Teaching During Family-Centered Rounds. *Hosp Pediatr*. 2018;8:44-48. doi:10.1542/hpeds.2016-0193

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Table 1. Key Elements of High-quality Educational Quality Improvement (EQI) Projects with Published Examples

Element	Published Example
1. Use a QI framework to clearly define what changes would constitute improvement: State clear educational objectives and *a priori* SMART (Specific, Measurable, Attainable, Relevant, Time-bound) aims, including process and balancing measures.	**Handley et al. 2020[19]:** Educational objectives: Increase identification of residents' learning goals and goal achievement on a neonatal/infant intensive care unit (N/IICU) rotation and increase rates of in-person feedback from fellows and/or attendings. SMART aims: Increase N/IICU rotating resident goal identification to 65%, goal achievement to 85%, and in-person feedback from a fellow and/or attending to 90% over 12 months and sustain these improvements for the following academic year.
2. Develop and engage an inclusive project team with key stakeholders (often a group larger than the targeted learners) to strengthen the intervention, assist with iterative tests of change and help sustain improvements (e.g., PDSA cycles).	**Dunbar et al. 2017[12]:** Faculty, chief residents, senior residents and the hospital's interdisciplinary Safety Team all contributed to and participated in this project to increase faculty and resident reporting of patient safety events through deliberate inclusion of patient safety into the teaching team's workflow.
3. Use QI tools (e.g., key driver diagrams, Pareto charts, and process maps) to organize and visually represent the gap(s) being addressed, intervention processes and metrics.	**Patel et al. 2017[20]:** Key driver diagram included in manuscript, outlining all of the following: project's global aim ("to modernize teaching on family-centered rounds"), SMART aim, key drivers/outcomes, and interventions with levels of reliability for each.
4. Design data collection over time. Avoid pre- and post-intervention comparisons. Display data over time using run charts, statistical process control (SPC) charts and/or time series analysis.	**Byrd et al. 2018[21]:** To track the number of times that a mobile device was used on rounds by inpatient teams, weekly observations were performed and analyzed over time using an SPC chart.

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