

# Creating Local Learning Health Systems: Think Globally, Act Locally

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Transforming the delivery of health care to maximize value, by measurably improving clinical outcomes while simultaneously reducing costs, is fundamental to reforming health care.

Achieving such a goal requires fundamental changes to health care delivery, through so-called clinical transformation efforts that better align people, processes, and technology.<sup>1</sup> As such efforts continue to gain momentum, they increasingly demonstrate the importance of weaving continuous and systematic evidence-generating medicine activities into routine practice.<sup>2</sup> This model creates a continuous cycle of systematic care improvement by coupling evidence generation with evidence application to health care that embodies and enables the goals of the learning health system (LHS).<sup>3</sup>

To date, there have been multiple efforts to establish LHSs, oriented primarily around the technical and operational integration of electronic health records (EHRs) among multiple health care systems (ie, a top-down approach).<sup>4,5</sup> While substantial progress has been made with this approach, the numerous cultural and operational barriers identified have led to the consideration of an alternative approach based on the development of local LHSs that start with the integration

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This is the author's manuscript of the work published in final edited form as:

Smoyer, W. E., Embi, P. J., & Moffatt-Bruce, S. (2016). Creating Local Learning Health Systems: Think Globally, Act Locally. *JAMA*, 316(23), 2481–2482.  
<https://doi.org/10.1001/jama.2016.16459>

of research, clinical care, and quality improvement (QI) within individual health care systems (ie, a bottom-up approach) and then expand successful activities across and among institutions.<sup>6</sup>

Local LHSs should create unique, sustainable homes for operational and academic expertise and resources from across health care delivery platforms. Such local systems also offer the opportunity to bring together key stakeholders within a given health care entity and align their historically varying interests around clinical transformation (eTable in the Supplement). In this model, interprofessional teams, when aligned appropriately, can work across clinical programs (both inpatient and outpatient), hospitals, and even health science campuses and regions to develop, implement, test, and disseminate innovative and transformative solutions for health care improvement. Incorporating patient priorities as well as the prevailing external regulatory and market forces can serve as additional guiding principles around prioritization of patient populations, care transformation episodes, and the determination of specific metrics for clinical transformation success. Ultimately, enhancing the value proposition requires significant integration of efforts to improve care with those to control costs.

### Leveraging Local LHSs

Understanding the complexity of incremental integration, an interdisciplinary team at Nationwide Children's Hospital recently developed and implemented a local LHS pilot program designed to fully integrate research, clinical care, and QI and then measured its ability to simultaneously improve clinical care, reduce care costs, and generate new knowledge to improve care. The pilot program, "Learn From Every Patient" (LFEP), included several key features. First, a clinical program and a clinical leader committed to systematic care improvement for that

program were identified. Key stakeholders recruited to the program included 4 physicians, 1 nurse, 11 clinical staff members, 1 program administrator, 2 hospital EHR team representatives, 1 enterprise data warehouse team representative, 2 research informatics systems team representatives, 2 hospital informatics systems team representatives, and patients and families.

Once this team was assembled, the benefits to both the organization and the patients were clarified, including (1) implementation of standardized care (evidence- and expert opinion–based), (2) systematic discrete collection of research data as part of all clinical visits, designed specifically to answer physicians’ clinical questions to improve their patients’ care, (3) opportunities for ongoing clinical and translational research publications (important for faculty career advancement), and (4) opportunities to participate in systematic improvement in the care of their patients. However, participation in the pilot program also required notable changes in work culture and routine work flows. These included altered clinical practices and EHR documentation processes for physicians and nurses (ie, robust discrete data entry vs free text entry) as well as altered interactions between the hospital and research informatics teams (ie, integrated clinical research data queries).

This LFEP pilot program was then implemented in a cohort of 131 children with cerebral palsy (CP) at a single center (LFEP group), with measurement of changes in health care utilization and health care charges during the initial 12 months of the program. In this group, interventions included initial standardized care for all patients (evidence- and expert opinion–based), routine clinical data collected in the EHR as discrete data fields (categories) and discrete data elements (choices within category), physician-inspired research data collection in the EHR, content-specific quality control of EHR data entry, and provision of standard care coordination.

Early results of the first 12 months of implementation of the LFEP pilot program (compared with the same children during the 12 months prior to entry into the program) revealed reductions within the LFEP group for inpatient admissions (by approximately 27%, from 0.75 to 0.55 per child per year), total inpatient days (by approximately 43%, from 4.67 to 2.68 per child per year), emergency department visits (by approximately 30%, from 1.18 to 0.83 per child per year), urgent care visits (by approximately 29%, from 0.50 to 0.35 per child per year), and total health care charges (by approximately 25%, from \$42 045 to \$31 700 per child per year).<sup>7</sup> For comparison, health care utilization and charges were also assessed in a non-LFEP control group that included 689 children with CP who received care at the same institution during the same period, received the standard of care (but not standardized care), and were provided with standard care coordination. Results from an identical 12-month comparison period (compared with these same children during the previous 12 months) revealed reductions within the non-LFEP group for inpatient admissions (by approximately 4%, from 0.48 to 0.46 per child per year) and total inpatient days (by approximately 38%, from 4.54 to 2.79 per child per year), increases in emergency department visits (by approximately 2%, from 0.67 to 0.68 per child per year), reductions in urgent care visits (by approximately 10%, from 0.31 to 0.28 per child per year), and reductions in total health care charges (by approximately 9%, from \$42 845 to \$39 096 per child per year).<sup>7</sup>

In addition, consistent with the goals of an LHS, the data collected in the EHR for 5 physician-inspired learning projects during the provision of routine clinical care during the 12-month pilot program have been used to generate several research reports about improving care. The data have also already led to an initial evidence-based improvement in the standardized care provided to participants with CP in the pilot program.<sup>7</sup> Even though this experience represents only a pilot

study at a single center, these outcomes suggest that a local LHS can be successfully and cost-effectively developed and implemented at a large medical center and that such programs can serve to systematically drive simultaneous clinical QI and reduced health care costs.

Several potential negative aspects of introduction of the LFEP program include the following: perceived loss of autonomy by treating physicians due to standardization of care; reluctance, resistance, or both by physicians and nurses to conversion to discrete data entry vs text entry; and potential compromise of the physician-patient relationship due to computer data entry during clinical encounters. In addition, the costs of pilot program implementation, which included care coordination costs and technical and operational costs, totaled approximately \$225 000 during the first year. However, these costs were equivalent to only approximately 16% of the total health care cost reduction realized during the first year of the pilot program (ie, a savings of approximately \$6 for each \$1 invested).

#### Future Opportunities

Clinical transformation to improve the value proposition of health care delivery of the future has created both unprecedented challenges and opportunities. Successful development and implementation of LHSs remain a highly desirable approach to achieve this needed transformation. Given the challenges experienced to date with the top-down approach to LHS creation, this early experience implementing a pilot program of a local LHS (ie, a bottom-up approach) suggests that the local LHS approach has the potential to be an effective complementary or alternative strategy for LHS program development to achieve the overall goal of clinical transformation at the national level. Benefits of the local LHS include systematic improvements in clinical care, reductions in health care expenditures, potential market

advantages for the provision of evidence-based care, unprecedented phenotyping of biological samples (for genomics, proteomics, metabolomics, etc), incorporation of patient-reported outcomes (PROs), and career advancement for academic faculty (via publications directed at care improvement).

In addition, LHS models are also ideally suited for accountable care organizations (ACOs), whereby medical centers receive fixed monthly per-patient payments regardless of health care utilization. However, there are numerous future challenges related to demonstrating the potential value of using local LHSs to develop a national adaptable LHS. Still awaiting affirmation is whether local LHSs can be successfully scaled across the wide variety of clinical episodes that constitute entire health care systems. However, these preliminary findings from this experience with implementing this disruptive innovation at a single center demonstrate that LHSs are indeed able to be implemented and that their feasibility and effectiveness can be tested. Future evaluations are necessary to help determine the potential utility of local LHSs as a model to develop LHSs at the regional, national, and possibly international levels.

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**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Dr Embi reported being a cofounder and having shares in Signet Accel, LLC, a software company that does business in the health and research data exchange space. No other disclosures were reported.

**Additional Information:** The authors have no current plans for commercialization or product development related to this article.

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