Spiraling healthcare costs in the United States and elsewhere, coupled to (1) mediocre outcomes and health status indices, (2) the persistent latency between the creation and application of best practice knowledge, (3) an inefficient public health and clinical research infrastructure, and (4) many other factors, demand a more sophisticated use of information technology to support improvements. The ever growing availability of digitally represented health information creates enormous potential to improve healthcare through computations involving diverse and dispersed data stores. The Learning Health System (LHS) is envisioned by many to be a computing health ecosystem, supported by an integrated health cyber-infrastructure, that will transform healthcare and improve the population health. The underlying premise is that the healthcare system needs to be (re)designed to more rapidly adjust and to address critical population and clinical health conditions if it is to produce demonstrable gains in health outcomes while reducing healthcare related economic burdens on individuals, businesses, and government.

An LHS cannot be a massive, centralized system; it needs to be an ecosystem of connected people, digital systems, and institutions, tied together with “just enough” standardization to carry out key functions dependably while allowing much room for adaptive learning and change through participatory governance.

Moving toward a LHS presents many technical, social, and economic challenges, which must be addressed from an integrated, systems perspective. A recent NSF sponsored, multi-disciplinary workshop developed a broad research agenda to address these challenges (http://healthinformatics.umich.edu/lhs/nsfworkshop).

Within the general LHS infrastructure model, there are several areas of interest. For example, a recent policy brief by the Commonwealth Foundation (http://tinyurl.com/krwpoa2) identified the following as key touchpoints for LHS:

- Learning from Large-Scale Research Networks
- Identifying At-Risk Patients
- Decision Support Tools to Support Learning
- Innovations Reducing Provider Overload
- Point-of-Care Trials
- Building Living Clinical Guidelines
- Finding Insights in Rudimentary Data
This minitrack will support this broad research agenda. We solicit submissions from academic, industry, and policy perspectives on a range of topics related to the development of an LHS. Within these requirements, example research issues of interest include, but are not limited to, the following:

LHS Design and Infrastructure- Application of computer and systems science, such as work on cyber-physical-social, ultra-large-scale, dependable, and model-based systems, and on risks, requirements, and tradeoffs in multi-objective systems, to the design and realization of an LHS; Defining, building, measuring, and sustaining confidence and trust in the LHS; Design and validation of fundamental protocols and frameworks for evolving standards for data sharing and data-mining; Governance design for rapid learning and change implementation.

LHS Theories – Models of large-scale health systems learning, Adaptive theories of health behavior change, Socio-technical models for healthcare improvement.

LHS Use Cases – Improving patient care, Identifying at-risk patients, Tracking community health improvements, Ad-Hoc improvements, Shortening improvement Cycles, Defining and measuring value from a LHS


LHS Stakeholders - Private Sector incentives (and barriers) for rapid learning, Public policy incentives (and barriers) to rapid learning, Patient empowerment as LHS strategy, Privacy and security analyses.

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