APPENDIX E. SUMMARY OF LITERATURE ON HEALTH INFORMATION EXCHANGE OUTCOMES AND RELATED MEASURES

Studies on the impact of electronic health information exchange (HIE) on health care and other outcomes can provide evidence-based measures of HIE impact. Hincapie et al.[1] conducted a systematic review of literature to identify and describe evidence of HIE impact on health care outcomes. Of 207 abstracts retrieved, only five articles met the inclusion criteria (e.g., original investigations in English that focused on HIE outcomes, definition of HIE). None of these five studies included long-term and post-acute care/long-term services and supports settings. Of these, three were randomized controlled trials, one involved retrospective review of data, and one was a prospective study. Hincapie found that HIE benefits on health care outcomes are still sparsely evaluated, and that among the measurements used to evaluate HIE, health care utilization is the most widely used.

The few articles that met the inclusion criteria varied significantly in methodology and different measures were used for outcome assessments. The majority of the outcomes measures focused on health care utilization such as number of visits to ED and duplication of services and costs. Only one of the three randomized controlled studies included in this review identified positive HIE outcomes. Overhage et al. found significant cost savings in ED charges per visit at one of the two hospitals involved.[2] In comparison, Lang et al. did not find differences in the number of repeated visits to EDs 2 weeks after the initial visit;[3] Hansagi did not find findings favoring HIE in any of the outcomes measured.[4] Moreover, in Vest's retrospective analysis, HIE use was associated with greater health care services utilization.[5]

Hincapie noted several reasons for the lack of results supporting HIE to improve cost and clinical outcomes such as improved quality of care and safety. The study intervention periods were relatively short, varying from 6 months to 30 months, which could prevent long-term benefits to become evident. Also, all studies aggregated costs and other utilization measures for analyzing data and results may be confounded by other factors such as illness severity differences in the study groups. Thus, there are

[1] Hincapie AL, Warholak TL, Murcko AC, et al. Physicians' opinions of a health information exchange. J Am Med Inform Assoc; 2011; 18(1): 60-65.

[2] Overhage JM, Dexter PR, Perkins SM, et al. A randomized, controlled trial of clinical information shared from another institution. Ann Emerg Med; 2002; 39(1): 14-23.

[3] Lang E, Afilalo M, Vandal A, et al. Impact of an electronic link between the emergency department and family physicians: A randomized controlled trial. Can Med Assoc J; 2006; 174(3): 313-318.

[4] Hansagi H, Olsson M, Hussain A, et al. Is information sharing between the emergency department and primary care useful to the care of frequent emergency department users? Eur J Emerg Med; 2008; 15(1): 34-39.

[5] Vest JR. Health information exchange and healthcare utilization. J Med Syst; 2009; 33(3): 223-231.

few evidence-based measures of HIE impact that can inform HIE intervention impact measures.

A more recent study by Frisse et al. investigated the impact of HIE within the ED setting.[6] Frisse studied the impact of HIE on several health services outcomes, including hospital admissions, head and body computed tomography (CT) use, and laboratory test ordering. Two methods of clinician access to HIE were investigated, including direct access to the HIE through a secure web browser. Frisse found that for EDs that provided direct access to HIE information through a portal, patients whose information was accessed when compared to matched patients whose information was not accessed had statistically significant differences in utilization for three outcomes: hospital admissions from the ED were reduced, while use of head CTs and chest x-rays increased.

Bailey et al. also note the dearth of evidence to support HIE to reduce unnecessary testing and improve the quality of ED care, and conducted a recent study, published in 2012, of whether HIE used in EDs reduces potentially unnecessary neuroimaging, increases adherence with evidence-based guidelines, and decreases costs in the ED evaluation of headache. HIE use was associated with decreased diagnostic imaging and increased evidence-based guideline adherence in the emergency evaluation of headache, but was not associated with improvements in overall costs.[7]

Kern et al. developed a framework and with advisement of a panel of 28 national experts, searched the literature to identify functionalities enabled by EHRs and HIE across three health care settings. They rated each of 233 functionality-setting combinations on their likelihood of having a positive financial effect, and validated the top-scoring functionalities with the national expert panel. The most highly rated HIE functionalities that could drive financial value are:

- Send and receive images, imaging reports and laboratory results.
- Receive discharge medication list from ED and inpatient settings.
- Enable structured medication reconciliation.
- Send and receive medication history from other providers for unstructured medication reconciliation.
- Send a query and receive information about formulary compliance.

[6] Frisse ME, Johnson KB, Nian H, et al. The financial impact of health information exchange on emergency department care. J Am Med Inform Assoc; 2012; 19(3): 328-333.

[7] Bailey JE, Wan JY, Mabry LM, et al. Does health information exchange reduce unnecessary neuroimaging and improve quality of headache care in the emergency department? J Gen Intern Med; 2013; 28(2): 176-183.

- Send and receive allergy history.
- Facilitate quality improvement reporting to external organizations.
- Send and receive authorizations for procedures.[8]

These high-value functionalities can serve as the basis for measures of data exchange functionality and for benchmarking (e.g., to monitor and compare what functionalities are available).

Hincapie recommended that future HIE evaluations with different levels of interoperability should incorporate a framework that allows a detailed examination of HIE outcomes that are likely to positively affect care.

Two existing HIE evaluation frameworks were identified in the literature review for this study. One was developed by Dixon et al.[9] for evaluating the costs, effort, and value of nationwide HIE with evaluation domains of five broad categories: implementation, technology, policy, data, and value. Each category enumerates a variety of measures and measure types. For example, the data exchange measures include volume of clinical data exchange activities inside the local HIE, completeness of information in a summary patient record, effort needed to massage the data into a normalized form, times/instances when required data are not available due to any reason, volume of clinical data exchange activities, number of patients registered within the HIE, ability to share data using continuity of care document/clinical document architecture formats, and percent of the data shared within the local HIE available as a clinical result.

These measures can help to better monitor and interpret the impact of care transitions and care coordination. For example, if an HIE intervention is to send secure Direct e-mail and the summary of care record is incomplete (data) because key data are not captured by the EHR or the interfaces with the EHR are not correctly developed (technology) or if only a small percent patients are registered with the HIE (implementation, policy, data) and can have their date retrieved or sent, or if staff are not trained to use the HIE (implementation), then the impact of the HIE intervention on other measures such as hospitalizations and rehospitalizations will be weak.

[8] Kern LM, Wilcox A, Shapiro J, et al. Which components of health information technology will drive financial value? Am J Manag Care; 2012; 18(8): 438-445.

[9] Dixon B, Zafar A, Overhage JM. A framework for evaluating the costs, effort, and value of nationwide health information exchange. J Am Med Inform Assoc; 2010; 17(3): 295-301.

Another framework, developed by the University of Maryland Center for Health Information and Decision Systems (CHIDS) is called the Evaluation Framework for Sustainable HIE. This framework consists of five interrelated and dimensions that are mutually reinforcing, and adequate performance in each dimension is necessary for the overall success and continued viability of a HIE organization (HIEO): value creation and sustainability; governance; technology; community engagement; and public trust. The CHIDS framework is relevant to measuring success and sustainability of the HIEO, but does not provide a framework to measure care coordination impact and outcomes.[10]

[10] Agarwal R, Crowley PK, Khuntia J, Mithas S. The District of Columbia Regional Health Information Organization (DC RHIO) Current Progress and the Road Ahead -- An Assessment Report based on the CHIDS HIE Evaluation Framework. University of Maryland Center for Health Information and Decision Systems, College Park, MD; 2010. Available at: http://www.rhsmith.umd.edu/files/Documents/Centers/CHIDS/DCRHIOAssessmentReport.pdf.

LONG-TERM AND POST-ACUTE CARE PROVIDERS ENGAGED IN HEALTH INFORMATION EXCHANGE: Final Report

Files Available for This Report

MAIN REPORT

Executive Summary	http://aspe.hhs.gov/daltcp/reports/2013/HIEengagees.shtml
HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.pdf

APPENDIX A. SELECTED PROGRAMS AND INITIATIVES THAT SUPPORT CARE COORDINATION AND INFORMATION EXCHANGE FOR PERSONS RECEIVING LTPAC/LTSS

HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendA
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengageA.pdf

APPENDIX B. FRAMEWORK TO CHARACTERIZE HEALTH INFORMATION EXCHANGE TO SUPPORT CARE COORDINATION FOR PERSONS RECEIVING LTPAC/LTSS

HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendB
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengageB.pdf

APPENDIX C. ENVIRONMENTAL SCAN AND LITERATURE REVIEW SOURCES

HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendC
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengageC.pdf

APPENDIX D. PROMISING COMPONENTS AND INTERVENTIONS TO REDUCE READMISSIONS

HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendD
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengageD.pdf

APPENDIX E. SUMMARY OF LITERATURE ON HEALTH INFORMATION EXCHANGE OUTCOMES AND RELATED MEASURES

HTML	http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendE
PDF	http://aspe.hhs.gov/daltcp/reports/2013/HIEengageE.pdf

APPENDIX F. EXAMPLES OF COMMUNITY-BASED CARE TRANSITION PROGRAM WITH LTPAC/LTSS PARTICIPATION

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendF
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageF.pdf

APPENDIX G. HEALTH INFORMATION EXCHANGE INTERVENTIONS AND ACTIVITIES IDENTIFIED THAT SUPPORT CARE COORDINATION FOR PERSONS RECEIVING LTPAC/LTSS

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendG
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageG.pdf

APPENDIX H. SITE VISIT SUMMARY: RUSH UNIVERSITY MEDICAL CENTER, CARE TRANSITIONS PROGRAM, BRIDGE PROGRAM

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendH
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageH.pdf

APPENDIX I. SITE VISIT SUMMARY: BEACHWOOD HOMES

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendI
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageI.pdf

APPENDIX J. SITE VISIT SUMMARY: EASTERN MAINE HEALTH SYSTEM, EASTERN MAINE HOME CARE

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendJ
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageJ.pdf

APPENDIX K. SUMMARY OF INFORMATION ROUTINELY EXCHANGED BY THE THREE SITES VISITED, BY CARE COORDINATION FUNCTION

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendK
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageK.pdf

APPENDIX L. STANDARDS AVAILABLE TO SUPPORT HEALTH INFORMATION EXCHANGE OF LONG-TERM AND POST-ACUTE CARE DATA

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendL
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageL.pdf

APPENDIX M. GLOSSARY

HTML http://aspe.hhs.gov/daltcp/reports/2013/HIEengage.shtml#appendM
PDF http://aspe.hhs.gov/daltcp/reports/2013/HIEengageM.pdf