Information Flow and Clinical Outcomes in a Fully Functional Perinatal Continuum of Care

Donald Levick MD
Lehigh Valley Health Network, donald.levick@lvhn.org

Michael Sheinberg MD
Lehigh Valley Health Network, Michael.Sheinberg@lvhn.org

Chad D. Meyerhoefer PhD

Mary E. Deily

Shin-Yi Chou PhD

See next page for additional authors

Published In/Presented At

Levick, D., Sheinberg, M., Meyerhoefer, C., Deily, M., Shin-Yi, C., & Sherer, S. (2013). *Information flow and clinical outcomes in a fully functional perinatal continuum of care.* Poster presentation.

Authors
Donald Levick MD, Michael Sheinberg MD, Chad D. Meyerhoefer PhD, Mary E. Deily, Shin-Yi Chou PhD, and Susan A. Sherer PhD

Information Flow and Clinical Outcomes in a Fully Functional Perinatal Continuum of Care

Donald Levick, MD, MBA[1]; Michael Sheinberg, MD[1]; Chad Meyerhoefer, PhD[2]; Mary Deily[2]; Shin-Yi Chou, PhD[2]; Susan Sherer, PhD[2]

[1]Lehigh Valley Health Network, Allentown, PA; [2]Lehigh University, Bethlehem, PA

Lehigh Valley Health Network
A PASSION FOR BETTER MEDICINE

- Largest academic community hospital in PA
- Largest Level 1 Trauma Center in Region
- Certified Comprehensive Stroke Center
- Magnet Hospital
- 3 hospital campuses
- Named a Top 50 Hospital in US News for 18 consecutive years
  - Employees - 12,135
  - Medical Staff - 1,193

Project Summary/Abstract

We are studying the implementation by the Lehigh Valley Health Network (LVHN) of an integrated electronic medical record (EMR) system at its OB/GYN practice groups and the Labor and Delivery (L&D) Unit. In this process, each of the practice groups migrated to a single, vendor-supplied, EMR, and these EMRs were linked to a newly-upgraded system at the hospital's L&D Unit to form an integrated EMR. Once the system was installed, medical information from each physician office was immediately available when a patient arrives at L&D, and information from a patient's visits to L&D is sent back to the office.

Our goal is to use both qualitative and quantitative methods to evaluate the impact of this system, so that we can fully assess the ability of an integrated EMR to address a recognized failure to deliver accurate, complete, and timely data to physicians and clinical staff at critical clinical points along the perinatal continuum of care.

Longitudinal, Mixed Methods Analysis

- Quantitative
  - Use quasi-experimental econometric methods to identify impact of interface of data between perinatal information system and ambulatory EMR on data completeness, health outcomes, patient and staff satisfaction
    - Data completeness surveys in L&D Triage
    - Provider/staff safety and satisfaction surveys
    - Adverse outcomes data and patient characteristics obtained from inpatient databases
    - Patient satisfaction surveys administered by Press Ganey
- Qualitative
  - In-depth interviews focusing on organizational and work process changes

Grant Information

- Award Information
  - Project Title: Data Flow & Clinical Outcomes in a Perinatal Continuum of Care System
  - Grant Number: 1R18HS018649-01A1
  - Principal Investigator: Donald Levick, MD
  - Project Period: 09/30/2011 – 09/29/2014
- IRB Approval
  - IRB Expedited Review Approval was obtained for both Lehigh University and Lehigh Valley Health Network at the onset of the project.
  - Updated approvals have been obtained as required by each institution.

Phase I

Discrete data moves from office EMR to Triage/L&D information system

Phase II

Triage Summary document moves from Triage I.S. to office EMR

Phase III

Discrete data moves from Triage/L&D I.S. to office EMR

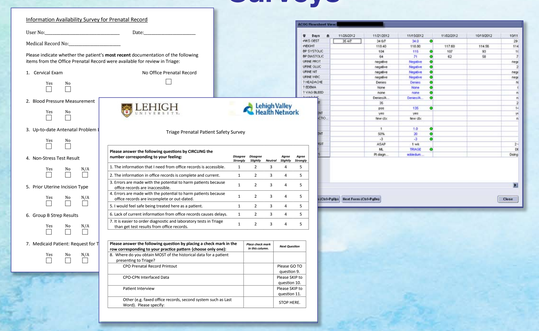
EMR Implementation

Phase A:
- Implement EMR in paper-based practices
- Replace EMR's in existing EMR practices

Phase B:
- Interface discrete data from office EMR to Triage/L&D clinical information system
- Interface Triage Summary back to office EMR

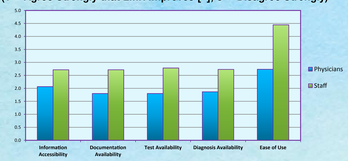
Phase C:
- Interface discrete elements from Triage to office EMR OB Flowsheet

Surveys



Physicians Perceive Limited Availability of Information From Triage at Offices and Find it More Difficult to Use EMR

(1 = Agree Strongly that EMR Improves [ ]; 5 = Disagree Strongly)



2010 Office Data: N=89 (74 staff; 15 physicians)

Quotes from Interviews

Trust:

I don't trust anything or anyone or anything automatically flowing - Physician

Availability of data:

Many times a patient would be seen in Triage in the interval between their visits, and you wouldn't even know it. So at least seeing that document triggers you to say, "oh, well she was in … triage. Why was she there?" - Physician

Empirical Methods

Model 1: Linear probability model (LPM)
- Outcomes (N=1,235)
  - Obstetric trauma (0/1), mean = 0.07
  - Labor inducement (0/1), mean = 0.56

Model 2: Two-part model (LPM & Log OLS)
- Outcomes (1st part, N=1,235 ; 2nd part, N=99)
  - Weighted adverse outcome score (WAOS) (0/1) > 0, mean = 0.08
  - Log(WAOS), mean of positive WAOS = 31.2

Control Variables:
- DCG/HCC risk score quartile, age, race/ethnicity, insurance type, admission type, multiple birth, pre-existing condition, non-preventable complication, c-section, instrument assisted delivery, indicators for whether clinical data elements were present in system, physician fixed effects

Conclusions

- Physicians have difficulty transitioning to EMR as main source of clinical information
- Integrated EMR does improve information availability on L&D Triage
- Improved information availability is associated (in some cases) with fewer adverse pregnancy events
  - Nonstress test, blood pressure, Antenatal problem lists have a statistically significant impact
- Improved information availability alters clinical decision making via more labor inductions

LEHIGH UNIVERSITY

- Lehigh University, established in 1865, is a premier residential research university, ranked in the top tier of national research universities each year.
- Enrollment:
  - 4,700 undergraduate students
  - 2,000 graduate students

Results

More Complete Data Available in Triage Due to EMR

Average monthly N = 119, Max = 193, Min = 16

Clinical Data Elements (=1 if available for review in L&D Triage)	Obstetric Trauma		Labor Induction	
	Parsimonious Model	Saturated Model	Parsimonious Model	Saturated Model
Cervical Exam	-0.027	-0.017	0.016	-0.012
	[0.020]	[0.023]	[0.026]	[0.036]
Blood Pressure	-0.036	-0.022	0.042	0.012
	[0.022]	[0.025]	[0.031]	[0.042]
Antenatal Prob. List	-0.010	0.016	0.057**	0.040
	[0.024]	[0.028]	[0.027]	[0.033]
Nonstress Test	-0.060**	-0.060*	0.034	0.011
	[0.026]	[0.033]	[0.044]	[0.046]
Prior Uterine Incision Type	0.021	0.044	0.035	0.013
	[0.036]	[0.039]	[0.060]	[0.060]
Group B Strep Status	-0.010	0.010	0.083**	0.069*
	[0.027]	[0.028]	[0.040]	[0.041]
Tubal Sterilization	-0.042	-0.041	-0.065	-0.070
Request (Medicaid)	[0.033]	[0.034]	[0.058]	[0.056]

Clinical Data Elements (=1 if available for review in L&D Triage)	WAOS > 0		Log(WAOS)	
	Parsimonious Model	Saturated Model	Parsimonious Model	Saturated Model
Cervical Exam	-0.008	-0.023	-0.317	0.024
	[0.021]	[0.025]	[0.305]	[0.558]
Blood Pressure	0.006	0.024	-0.653**	-0.240
	[0.021]	[0.026]	[0.248]	[0.713]
Antenatal Prob. List	0.003	0.003	-1.002***	-1.101***
	[0.024]	[0.032]	[0.243]	[0.386]
Nonstress Test	0.002	0.012	0.090	0.387
	[0.032]	[0.031]	[0.371]	[0.492]
Prior Uterine Incision Type	-0.045	-0.081*	0.258	0.407
	[0.036]	[0.036]	[0.643]	[0.665]
Group B Strep Status	0.000	0.010	-0.459	-0.238
	[0.030]	[0.029]	[0.493]	[0.464]
Tubal Sterilization	-0.058*	-0.051*	-2.901	0.267
Request (Medicaid)	[0.031]	[0.030]	[2.032]	[3.080]

Contact Information:

Lehigh University
Department of Economics
- Chad Meyerhoefer, PhD chm308@lehigh.edu
- Mary Deily, PhD
- Shin-Yi Chou, PhD

Department of Management
- Susan Sherer, PhD

Lehigh Valley Health Network
- Donald Levick, MD, MBA, Chief Medical InformationOfficer Donald.Levick@LVHN.org

Department of OB-GYN
- Michael Sheinberg, MD

A PASSION FOR BETTER MEDICINE.™ Lehigh Valley Health Network

610-402-CARE LVHN.org