

BIOGRAPHICAL SKETCH

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NAME: Rosenbloom, Samuel Trent, M.D., M.P.H.

eRA COMMONS USER NAME (credential, e.g., agency login): rosenbst

POSITION TITLE: Associate Professor; Vice Chair for Faculty Affairs

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Northwestern University, Evanston, IL	B.A.	06/1992	Mechanical Engineering
Vanderbilt University School of Medicine, Nashville, TN	M.D.	05/1996	Medicine
Vanderbilt University School of Medicine, Nashville, TN	MPH	12/2001	Public Health

A. Personal Statement

Dr. Rosenbloom is the Vice Chair for Faculty Affairs and an Associate Professor of Biomedical Informatics, Medicine, Pediatrics and Nursing at Vanderbilt University Medical Center. Dr. Rosenbloom is a nationally recognized investigator in the field of health information technology evaluation. His research has focused on studying how patients and healthcare providers interact with health information technologies. His work has been supported through extramural funding from the National Library of Medicine, the Patient Centered Outcomes Research Institute, the Agency for Healthcare Research and Quality and through subcontracts from the Department of Health and Human Services, the Department of Veterans' Affairs and the Center for Disease Control and Prevention. Dr. Rosenbloom's work has resulted in lead and collaborating authorship on over 70 peer reviewed manuscripts, 6 book chapters and numerous posters, white papers and invited papers. He has been a committed member of the principal professional organization in his field, the American Medical Informatics Association (AMIA), was the annual recipient of the competitive AMIA New Investigator Award in 2009, and was elected to the American College of Medical Informatics (ACMI) in 2011. Dr. Rosenbloom has experience managing grant-funded projects and leading investigator teams evaluating informatics-based tools, and is currently serving as a co-principal investigator on for the PCORI-funded Midsouth CDRN research network. As a nationally-recognized expert in patient engagement technologies, Dr. Rosenbloom directs the Vanderbilt patient portal, one of the oldest continually active patient portals in the country with over 300,000 registered users accessing it more than 2.7 million times annually. In this role, Dr. Rosenbloom has had the good fortune to work with Dr. Purcell-Jackson as she has stood up the Vanderbilt hospital-based Electronically-Engaged Pediatric Family (EPEF) Consultation Service. Dr. Rosenbloom supports efforts to engage with patients, families and caregivers with health information technologies and through sharing of their own clinical data. For this project, Dr. Rosenbloom looks forward to providing advisorial support, and will donate time in kind as part of his other institutional patient engagement effort.

Relevant Peer Reviewed Publications (up to 4):

1. **Rosenbloom ST**, Stead WW, Giuse D, Lorenzi NM, Brown SH, Johnson KB. Generating Clinical Notes for Electronic Health Record Systems. *Appl Clin Inform.* 2010 Jan 1;1(3):232-243. PMID: 21031148.
2. Osborn CT, **Rosenbloom ST**, Stenner S, Anders S, Muse S, Johnson KB, Jirjis J, Purcell Jackson G. MyHealthAtVanderbilt: Policies and Procedures Governing Patient Portal Functionality. *J Am Med Inform Assoc.* 2011 Dec;18 Suppl 1:i18-23. doi: 10.1136/amiainl-2011-000184. Epub 2011 Jul 31. PMID: 21807648.

3. Middleton B, Bloomrosen M, Dente MA, Hashmat B, Koppel R, Overhage JM, Payne TH, **Rosenbloom ST**, Weaver C, Zhang J. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. *J Am Med Inform Assoc*. 2013 Jan 25. PMID: 23355463.
4. Cronin RM, Davis SE, Shenson JA, Chen Q, **Rosenbloom ST**, Purcell Jackson G. Growth of Secure Messaging Through a Patient Portal as a Form of Outpatient Interaction across Clinical Specialties. *Appl Clin Inform*. 2015 6(2)288-304. <http://dx.doi.org/10.4338/ACI-2014-12-RA-0117>.

B. Positions and Honors

Positions and Employment

- | | |
|----------------|--|
| 1996 – 2000 | Internship and Residency in Internal Medicine and Pediatrics, Vanderbilt University Medical Center, Nashville, TN |
| 2000 – 2002 | Fellowship in Biomedical Informatics and Public Health, Vanderbilt University School of Medicine, Nashville, TN |
| 2000 – 2010 | Attending Physician in Internal Medicine, Department of Medicine, Tennessee Valley Healthcare Services (Veterans Administration Hospital), Nashville, TN |
| 2002 – 2004 | Instructor in Biomedical Informatics, Internal Medicine and Pediatrics, Vanderbilt School of Medicine, Nashville, TN |
| 2002 – 2004 | Instructor in Clinical Nursing, Vanderbilt School of Nursing, Nashville, TN |
| 2004 – 2011 | Assistant Professor in Biomedical Informatics, Internal Medicine, Pediatrics and Nursing, Vanderbilt University Medical Center, Nashville, TN |
| 2011 – present | Associate Professor in Biomedical Informatics, Internal Medicine, Pediatrics and Nursing, Vanderbilt University Medical Center, Nashville, TN |

Honors

- | | |
|-----------|--|
| 1998-1998 | Teaching Awards in Pediatrics, |
| 2004 | Vanderbilt Physician Scientist Development Award |
| 2009 | American Medical Informatics Association (AMIA) New Investigator Award |
| 2011 | Election to the American College of Medical Informatics (ACMI) |

Licensure

- | | |
|----------------|---|
| 2001 – present | Diplomat, American Board of Pediatrics, |
| 2001 – present | Diplomat, American Board of Internal Medicine |

C. Contribution to Science

C.1. Patient Engagement Technologies:

Dr. Rosenbloom has expertise in technologies used to engage patients and their caregivers in their own healthcare delivery, with a focus on patient portals. With this background, he currently directs the Vanderbilt patient portal which has been in continuous use for over a decade, and which engages more than 1 in 3 Vanderbilt patients. From an operational standpoint, Dr. Rosenbloom has led efforts to make the Vanderbilt patient portal software more modern, usable and satisfying while overseeing an expanding user base. He has also helped guide a restructuring of governance to align patient portal functionality with user needs, institutional executive leadership strategy, and external requirements, such as for meaningful use certification. Dr. Rosenbloom has also initiated efforts to ensure that the patient portal is usable on increasingly prevalent mobile devices. From an academic standpoint, Dr. Rosenbloom has been a principal investigator receiving extramural funding to support research and tool development efforts on patient engagement technologies and patient portals from AHRQ and PCORI. Dr. Rosenbloom has also participated in the policy making efforts on the part of the American Medical Informatics Association, the principal professional organization in his field. The policy work led to the following publication:

Brennan PF, Valdez R, Alexander G, Arora S, Bernstam EV, Edmunds M, Kirienko N, Martin RD, Sim I, Skiba D, **Rosenbloom ST**. Patient-centered care, collaboration, communication, and coordination: a report

from AMIA's 2013 Policy Meeting. J Am Med Inform Assoc. 2015 Apr;22(e1):e2-6. doi: 10.1136/amiajnl-2014-003176. Epub 2014 Oct 30. PMID: 25359545.

People are increasingly capturing health, wellness and clinical data using a growing number of technologies. In this space, Dr. Rosenbloom coined the term, "Person Generated Health Data" to refer to health data generated by people who may or may not identify themselves as patients via numerous connected devices, tools or online forms. Examples include wrist-worn accelerometers that monitor daily footsteps, global positioning service-enabled devices that record asthma treatments, track miles run or biked, web-based health journaling tools, smart online food diaries and networked weight scales or blood pressure machines. Dr. Rosenbloom is currently a guest editor of a special issue JAMIA on person generated health data, which focuses on technologies used to record, manage, interpret and display data representing health, wellness and clinically-related activities. Dr. Rosenbloom has spoken internationally on patient engagement technologies, person generated health data, and pervasive monitoring.

C.2. Clinical Interface Terminologies:

Dr. Rosenbloom is also an international expert in developing and implementing standards and terminology, with a focus on terminologies designed to interface between health information technologies and nonterminologists. Such terminologies designed to be by healthcare providers—such as physicians and nurses—and patient when interacting with health information technologies are called Interface Terminologies. In his research funded by the National Library of Medicine (5K22 LM008576-02), Dr. Rosenbloom discovered that interface terminologies benefit from attributes that are neither necessary for more appropriate for other terminology standards. These attributes include a wide set of rich synonyms, clinically appropriate linkages among related concepts, and extensions that support natural generation. Dr. Rosenbloom wrote two of the seminal manuscripts on these so-called interface terminologies:

Rosenbloom ST, Miller RA, Johnson KB, Elkin PL, Brown SH. Interface Terminologies: facilitating direct entry of clinical data into electronic health record systems. J Am Med Inform Assoc. 2006 May-Jun;13(3):277-88. Epub 2006 Feb 24. PMID: 16501181.

Rosenbloom ST, Miller RA, Johnson KB, Elkin PE, Brown SH. A Model for Evaluating Interface Terminologies. J Am Med Inform Assoc. 2008 Jan-Feb;15(1):65-76. Epub 2007 Oct 18. doi: 10.1197/jamia.M2506. PMID: 17947616.

This research laid a foundation for subsequent work evaluating attributes supporting successful clinical documentation, both when structured over an interface terminology and when more narratively-focused. An important finding Dr. Rosenbloom and his team observed is that given current technology, terminology standards, and diverse clinical practice models, no single approach to clinical documentation is appropriate for all needs. This work is presented in:

Rosenbloom ST, Denny JC, Xu H, Lorenzi N, Stead WW, Johnson, KB. Data From Clinical Notes: a perspective on the tension between structure and flexible documentation. J Am Med Inform Assoc. 2011 Mar-Apr;18(2):181-6. doi: 10.1136/jamia.2010.007237. Epub 2011 Jan 12. PMID: 21233086.

Dr. Rosenbloom was tapped to participate in and Amy health policy meeting in date that made this recommendation, and that more research is needed, as discussed in the following manuscript.

Cusack CM, Hripcsak G, Bloomrosen M, **Rosenbloom ST**, Weaver CA, Wright A, Vawdrey DK, Walker J, Mamykina L. The future state of clinical data capture and documentation: a report from AMIA's 2011 Policy Meeting. J Am Med Inform Assoc. 2013 Jan 1;20(1):134-40. doi: 10.1136/amiajnl-2012-001093. Epub 2012 Sep 8. PMID: 22962195.

C.3. Electronic Pediatric Growth Charts:

Dr. Rosenbloom is a leader in developing and evaluating electronic pediatric growth charts. Pediatric growth charts have been developed by the Centers for Disease Control and Prevention (CDC) and the World Health

Organization (WHO) to help healthcare providers and families assess children's nutritional and general health status. With growth charts, growth patterns can be easily reviewed to determine whether a child is following the expected trajectory. Managing and presenting growth data have particular importance in pediatrics. Dr. Rosenbloom's research on pediatric growth charts established a minimum set of requirements for comprehensive EHR systems used in pediatrics, including automatically generating electronic curves in normal workflows, efficiently calculating growth trajectories, adding in support for mid parental height measurements, and modifying the curves to represent populations that typically grow differently from the unaffected population, such as children with Down syndrome. These findings were published as:

Rosenbloom ST, Qi XF, Riddle WR, Russell W, DonLevey SC, Giuse D, Sedman AB, Spooner SA. Implementing Pediatric Growth Charts via an Electronic Health Record System. J Am Med Inform Assoc. 2006 May-Jun;13(3):302-8. Epub 2006 Feb 24. PMID: 16501182

Based on this research, the American Academy of Pediatrics (AAP) Task Force on Medical Informatics made similar recommendations in their "Special Requirements for Electronic Medical Record Systems in Pediatrics" policy statements. Dr. Rosenbloom's work on electronic pediatric growth charts has focused especially on charts for children with Down syndrome. Down syndrome, or Trisomy 21, is the most common congenital genetic disease affecting children's growth, occurring in one in 732 live births in the United States. Children with Down syndrome exhibit characteristic physical, mental, and developmental patterns including intellectual impairment, congenital heart disease and characteristic dysmorphisms, and they grow differently from the unaffected population. Classic standard and widely used, paper-based Down syndrome specific growth charts created by Cronk et al. were developed prior to modern advancements in treatments for prematurity, congenital cardiac disease, and nutritional deficiencies. As a result, these charts may not reflect the present growth patterns of children with Down syndrome in the US. To address this, the AAP published in their 2011 Health Supervision for Children With Down Syndrome, "The previously used Down syndrome-specific growth charts no longer reflect the current population styles and body proportion. Until new charts are developed, patterns of growth and weight gain should be followed on the available standard growth charts and should include use of weight for height and BMI." Dr. Rosenbloom has assembled a large-scale, multi institutional modern data set containing anthropomorphic measurements from children across the country with Down syndrome to support developing modern growth charts for children with Down syndrome. At present, this database contains 89,337 data points collected from 8502 patients seen at 12 different healthcare systems across the country over 14 years, and Dr. Rosenbloom's team is actively developing updated growth charts from it. These updated Down syndrome growth charts will be designed to be easily implemented into EHR systems. Pilot work is presented in:

Rosenbloom ST, McGregor TL, Chen Q, An AQ, Hsu S, Dupont WD. Specialized Pediatric Growth Charts For Electronic Health Record Systems: the example of Down syndrome. AMIA Annu Symp Proc. 2010 Nov 13;2010:687-91.

C.4. Complete List of Published Work in My Bibliography:

<http://www.ncbi.nlm.nih.gov/pubmed?term=rosenbloom+st&cmd=DetailsSearch>

https://www.researchgate.net/profile/S_Rosenbloom

https://scholar.google.com/citations?hl=en&user=k2RLJ0kAAAAJ&view_op=list_works&sortby=pubdate

D. Research Support

Ongoing Research Support

PCORI (R. Rothman, S. T. Rosenbloom, P. Harris)

03/11/2014 – 09/11/2015

CDRN-1306-04869

The Mid-South Clinical Data Research Network

As one of 11 national clinical data research networks, our project will connect multiple health systems throughout the Southeast United States to facilitate more efficient clinical effectiveness research that could significantly increase the amount of information available to healthcare decision makers and the speed at which it is generated.

Role: Co-Principal Investigator

HRSA (B. Pilon)
UD7HP25064

09/01/2012 - 06/30/2015

Nurse Education, Practice, Quality, and Retention - Interprofessional Collaborative Practice

The goal of this project is to establish innovative scholarly advanced practice nurse practice models that define and respond to health care trends, by continuing to establish inter-and multi-disciplinary practice partnerships both internal and external to Vanderbilt, and that are replicable in a variety of health settings. This project supports the Vanderbilt University School of Nursing faculty practice program through its Mercury Courts Clinic and House Calls program (MCCHC), its first nurse-led interprofessional collaborative practice (IPCP) arrangement.

Role: Co-Investigator

5 R01 HS021496-02 (Jackson)

07/23/2013 – 07/31/2017

Agency for Healthcare Research and Quality

Personal Health Information Needs and Practices for Maternal Fetal Care

The proposed research project is a comprehensive study to investigate the characteristics, health information needs and information management practices of pregnant women and their caregivers to inform the design of health information technologies.

Role: Co-Investigator

Completed Research Support

RTI Task Order 005 (Rosenbloom)

09/01/2013 – 08/31/2014

AHRQ Subcontract with Research Triangle Inst.

Evaluation of Stage 3 Meaningful Use Objectives

The task order objectives are to: 1) Evaluate the usefulness, in practice, of up to two tools or resources from the Health IT Tools and Resources section of the NRC Web site, and 2) Propose and implement revisions to the tools or resources that will enhance their usability, usefulness, and ability to achieve their intended goals.

HHS (S. T. Rosenbloom)

04/01/2010 - 03/31/2014

HHSP23320095647WC

Evaluation of State HIE Cooperative Agreement Program

In this project, I am working with the National Opinions Resource Center as a subcontractor to help develop and apply a framework for evaluating states' health information exchange, as mandated by the Office for the National Coordinator.

Role: Subcontract Principal Investigator

NLM (H. Xu)

05/31/2010 – 05/30/2013

1 R01 LM010681-01

Real-time Disambiguation of Abbreviations in Clinical Notes

The goal of this project is to develop, evaluate, and share a systematic approach to recognizing and disambiguating abbreviations in clinical notes, with an ultimate goal of improving existing natural language processing and computer-based documentation systems. The study will develop automated methods to detect abbreviations and their senses from clinical text corpora and build a comprehensive knowledge base of clinical abbreviations; develop and evaluate methods to maximize both their performance and coverage; demonstrate the system's effectiveness by integrating it with two established natural language processing systems; and integrate it into an institutional clinical documentation system.

Role: Site Principal Investigator

AHRQ (S. T. Rosenbloom)

09/01/2010 - 08/31/2013

1 R18 HS019276-01

Disseminating Adapted Diabetes Evidence To Clinicians Through A Patient Portal

The goal of this project is to adapt an AHRQ Comparative Effectiveness Summary Guide to be concise, targeted, and easily actionable, and it will disseminate it to patients and healthcare providers through a patient

portal and electronic health record system, respectively. The investigators will use qualitative and quantitative methodologies to evaluate understanding and application of the adaptation.

Role: Principal Investigator

NLM (S.T. Rosenbloom)

09/30/2008 – 09/29/2012

1 R01 LM009591-01A1

A Framework Based Clinical Documentation Evaluation Method

The goal of the project is to extend, validate and apply a framework for evaluating different methods for documenting clinical care. To do this, we are evaluating whether generating clinical notes by using computer based documentation systems increases accuracy, decreases documentation time and expressivity, and does not impact satisfaction when compared to handwritten or dictated and transcribed notes. Evaluation methods include unstructured task analysis, focus groups and standardized patient encounters to compare numerous documentation methods on documentation accuracy, expressivity and time efficiency, patient and subject satisfaction, and documentation-related workflow tasks. Outcomes will be measured from note content, structured task analysis of video recordings, and questionnaires.

Role: Principal Investigator

NLM (Gadd)

07/01/2010 – 06/30/2011

3 T15 LM007450-09S1

Vanderbilt Biomedical Informatics Training Program – Curriculum Supplement

The supplement will be used to fund curriculum initiatives that will enhance existing MS and PhD degree curriculum components and develop significantly revised or new curricular content that further strengthens our clinical informatics, bioinformatics, and translational and research informatics education and training.

NLM (S.T. Rosenbloom)

02/01/2005 – 01/31/2009

5K22 LM008576-02

Testing Evaluation Metrics for Interface Terminologies

The purpose of this study is to develop and test a methodology for evaluating clinical interface terminology usability by identifying and examining measurable terminological attributes. Neither MEDCIN or SNOMED CT, two terminologies commonly used as clinical interface terminologies, have been evaluated in terms of their usability or suitability as clinical interface terminologies.

Role: Principal Investigator