OMB No. 0925-0001 and 0925-0002 (Rev. 10/15 Approved Through 10/31/2018)

BIOGRAPHICAL SKETCH

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NAME: Michael M. Wagner, MD, PhD

eRA COMMONS USER NAME (credential, e.g., agency login): mmw007

POSITION TITLE: Professor of Biomedical Informatics

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
SUNY at Stony Brook, Stony Brook, NY	BS	1975	Biology
New York University School of Medicine, NY	MD	1979	Medicine
University of Pittsburgh, Pittsburgh, PA	MS	1991	Intelligent Systems
University of Pittsburgh, Pittsburgh, PA	PhD	1995	Intelligent Systems

A. Personal Statement

Dr. Wagner is the Principal Investigator of this project and has primary responsibility for the overall conduct of research. Additionally, he will be responsible for ensuring that the Salt Lake County and Allegheny County research data sets are well documented and of identical structure and meaning.

Dr. Wagner has conducted research on real-time outbreak and disease surveillance for more than 15 years. He has contributed over 50 peer-reviewed research papers in this area and served as editor-in-chief and a principal contributor for Handbook of Biosurveillance (Academic Press, 2006). He has worked closely with members of the proposal team during the first performance period of this competitive renewal proposal. Dr. Wagner has served as Principal Investigator of multi-institutional, interdisciplinary projects supported by NLM, AHRQ, DARPA, CDC, NIGMS, the Pennsylvania Department of Health, and the Sloan Foundation. Dr. Wagner has a strong track record translating of research to practice, having directed the development of the Real-time Outbreak and Disease Surveillance (RODS) system, the National Retail Data Monitor, and the probabilistic disease surveillance system described in this proposal.

1. **Wagner MM**, Moore AW, Aryel RM. Handbook of Biosurveillance. Oxford: Elsevier Academic; 2006
2. Influenza Monitoring System. Video of system operation: https://www.youtube.com/watch?v=qOlGbrTsS-A
3. **Wagner MM**, Robinson JM, Tsui F-C, Espino JU, Hogan WR. Design of a National Retail Data Monitor for public health surveillance. J Am Med Inform Assoc. (JAMIA) 2003 Sep-Oct;10(5):409-18.

B. Positions and Honors

Professional Experience

1982 - 1984 Attending Physician, Bellevue Hospital, NYC, NY
1982 - 1984 Instructor in Medicine, NYU School of Medicine
1984 - 1988 Internist, Hawaii Permanente Medical Group
1988 - 1991 National Library of Medicine Fellow in Informatics, University of Pittsburgh
1991 - 1994 Instructor in Medicine, University of Pittsburgh School of Medicine

1991 - 2002 Attending Physician, Presbyterian Hospital, Pittsburgh, PA
1994 - 2002 Assistant Professor of Medicine, University of Pittsburgh School of Medicine
1996 - 2002 Assistant Professor of Intelligent Systems, University of Pittsburgh
2000 - Founder and Director, RODS (Real-time Outbreak and Disease Surveillance) Laboratory
2002 - 2015 Associate Professor of Biomedical Informatics and Intelligent Systems, University of Pittsburgh
2016 - Professor of Biomedical Informatics and Intelligent Systems, University of Pittsburgh

Honors

1975 Phi Beta Kappa and the Senior Athlete Award, Stony Brook University
1995 Martin Epstein Award (first place, student paper competition), Nineteenth Annual Meeting of the American Medical Informatics Association
2003 Elected as Fellow of the American College of Medical Informatics

C. Contribution to Science

Dr. Wagner has conducted research in clinical and population informatics.

1. Clinical Informatics

Dr. Wagner has published on the diagnostic value of the history and physical examination, automatic indexing of medical images, decision-theoretic methods for bringing information to a clinician's attention at the point of care, data accuracy in EMRs, representational formalisms for decision support, systems that collect data from EMRs, and methods for delivering information to clinicians at the point of care.

a) **Wagner MM**, Cooper GF. An automatic indexing method for medical documents. Computers and Biomedical Research. 1992:(25)336-350.
b) **Wagner MM**, Cooper GF. Decision-theoretic information pretrieval: a generalization of reminding. Proc Annu Symp Comput Appl Med Care. 1993:512-6.
c) **Wagner MM**, Cooper GF. Evaluation of a belief-network-based reminder system that learns from utility feedback. J Am Med Inform Assoc. Supplement on the Proceedings of the Nineteenth Annual Symposium on Computer Applications in Medical Care. 1995:666-673.

2. Population Informatics: Real-time Disease Surveillance

Many real-time methods used in clinical decision support can be applied at the population level. Dr. Wagner has published on case- and outbreak-detection performance of algorithms that analyze a wide range of data automatically collected from EMR systems.

a) **Wagner MM**, Tsui F-C, Espino JU, Dato VM, et al. The emerging science of very early detection of disease outbreaks. J Public Health Manag Pract. 2001 Nov;7(6):51-9.
b) Panackal AA, M'ikanatha NM, Tsui F-C, McMahon J, **Wagner MM**, et al. Automatic electronic laboratory-based reporting of notifiable infectious diseases at a large health system. Emerg Infect Dis. 2002 Jul;8(7):685-91.
c) Gesteland PH, Gardner RM, Tsui F-C, Espino JU, Rolfs RT, James BC, **Wagner MM**. Automated syndromic surveillance for the 2002 Winter Olympics. JAMIA. 2003 Nov-Dec;10(6):547-54.
d) **Wagner MM**, Dato VM, Dowling JN, Allswede M. Representative threats for research in public health surveillance. J Biomed Inform. 2003 Jun;36(3):177-88.

3. Population Informatics: Decision Support

With student Ming Tsai, Dr. Wagner implemented *BioEcon,* a program that constructs decision models of infectious disease control strategies automatically and published several economic analyses

a) **Wagner MM**, Wallstrom GL, Onisko A. Issue a boil-water advisory or wait for definitive information? A decision analysis. AMIA Annu Symp Proc. 2005:774-778. PMCID: PMC1560439.
b) Lee BY, Stalter RM, Bacon KM, Tai JH, Bailey RR, Zimmer SM, **Wagner MM**. Cost-effectiveness of adjuvanted versus nonadjuvanted influenza vaccine in adult hemodialysis patients. Am J Kidney Dis. 2011 May; 57(5):724-32. PubMed PMID: 21396760. PMCID: PMC3085888.

c) Lee BY, Tai JH, McGlone SM, Bailey RR, Wateska AR, Zimmer SM, Zimmerman RK, **Wagner MM**. The potential economic value of a 'universal' (multi-year) influenza vaccine. Influenza Other Respi Viruses. 2012 May;6(3):167-75. PubMed PMID: 21933357. PMCID: PMC3253949.

4. Population Informatics: Probabilistic, Decision-theoretic Disease Surveillance and Control
The BioEcon research identified new research topics, which are the foci of his current research as described in this section and the next. The first problem was that disease surveillance systems did not produce the information needed for the kind of decision support that BioEcon was capable of providing. Decision support of this kind requires epidemic simulators to project the outcomes of a set of possible disease control measures. Disease surveillance systems simply did not produce the information needed to initialize the simulators. This ongoing research has developed the requisite capability and is evaluating it using multi-year datasets for Allegheny County, PA and Salt Lake County, UT.

a) **Wagner MM**, Tsui F, Cooper GF, et al. Probabilistic, decision-theoretic disease surveillance and control. Online Journal of Public Health. 2011 Dec; 3(3). PMCID: PMC3615794.
b) Ye Y, Tsui F-C, **Wagner M**, Espino JU, Li Q, Influenza detection from emergency department reports using natural language processing and Bayesian network classifiers, Journal of American Medical Informatics Association, 21(5): 2014 Sep-Oct, 2014, pp815-23, PMCID: PMC4147621.
c) Lopez Pineda A, Ye Y, Visweswaran S, Cooper GF, **Wagner MM**, Tsui FR. Comparison of machine learning classifiers for influenza detection from emergency department free-text reports. Journal of Biomedical Informatics. Sep 16, 2015. PMCID: PMC4684714.
d) Cooper GF, Villamarin R, Tsui, F-C, Millett N, Espino JE, **Wagner MM**. A Method for Detecting and characterizing outbreaks of infectious disease from clinical reports. J Biomed Inform. 2015 Feb 28; 53:15-26. PMCID: PMC4441330.
e) Ferraro JP, Ye Y, Gesteland PH, Haug PJ, Tsui FR, Cooper GF, Van Bree R, Ginter T, Nowalk AJ, **Wagner M**. The effects of natural language processing on cross-institutional portability of influenza case detection for disease surveillance. Appl Clin Inform. 2017 May 31;8(2):560-580. doi: 10.4338/ACI-2016-12-RA-0211. PubMed PMID: 28561130. PMC in-process.
f) Ye Y, **Wagner MM**, Cooper GF, Ferraro JP, Su H, Gesteland PH, Haug PJ, Millett NE, Aronis JM, Nowalk AJ, et al. A study of the transferability of influenza case detection systems between two large healthcare systems. PLoS One. 2017 Apr 5;12(4):e0174970. doi: 10.1371/journal.pone.0174970. eCollection 2017. PMCID: PMC5381795.

5. Population Informatics: Improving Access to Epidemic Simulators and Representing Knowledge and Data in Population Biology
A second problem identified by the BioEcon research was access to epidemic simulators. This research has developed a standard representation for infectious disease scenarios for simulation, which includes representations of populations, infections, contaminations, control measures.

a) **Wagner MM**, Levander JD, Brown S, Hogan WR, Millett N, Hanna J. Apollo: Giving application developers a single point of access to public health models using structured vocabularies and Web services. AMIA Annu Symp Proc. 2013:1415-24. PubMed PMID: 24551417. PMCID: PMC3900155.
b) Hogan WR, **Wagner MM,** Brochhausen M, Levander J, Brown ST, Millett N, et al. The Apollo Structured Vocabulary: an OWL2 ontology of phenomena in infectious disease epidemiology and population biology for use in epidemic simulation. Journal of Biomedical Semantics. 2016;7(1):1-12. PMID: 27538448 PMCID: PMC4989460

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/sites/myncbi/michael.wagner.1/bibliography/43456164/public/?sort=date&direction=descending

D. Research Support

Ongoing Research Support

1U24GM110707-01 **(**Wagner and Espino**)** 08/05/2014 – 04/31/2019

NIH/NIGMS
MIDAS Informatics Services Group
The specific aims of this project are to (1) develop software for end users ranging from modelers to decision makers; (2) synthesize a large range of populations and environments for use by modelers; (3) significantly extend a prototype Apollo Library, which stores standardized computable information; (4) significantly extend an ontology-based information management system (IMS), which can index and retrieve datasets, models, publications, and Apollo Library items; (4) create an “On Demand” High Performance Computing (HPC) Service; and (5) play other catalytic roles in the MIDAS research network, including logistical support, data acquisition, model validation, software engineering and software quality control.
Role: Corresponding PI

1R01LM011370-01A1 (Wagner) 08/01/13-07/31/2016 (no-cost extension to 7/2017)
NIH/NLM
Probabilistic Disease Surveillance
The specific aims of this project are to (1) advance the development and integration of the components of a probabilistic disease surveillance system, including the ability to detect and characterize concurrent outbreaks and outbreaks of unknown diseases; (2) extend the approach from influenza to three other respiratory diseases; and (3) measure the performance of the NLP, case detection, and outbreak detection and characterization components individually, including their portability, and as a system.
Role: PI

Completed Research Support (Last Three Years)

5R01GM101151-02 (Wagner and Hogan) 04/18/12-03/31/17
NIH/NIGMS
Apollo: Increasing Access and Use of Epidemic Models Through the Development and Adoption of a Standard Ontology
The specific aims of this project are to (1) develop a standard vocabulary for the field of epidemic modeling using a tool called Protégé; (2) create two extensions to Protégé that are needed by the project; (3) develop a standard syntax using the vocabulary for representing the inputs (e.g., disease control measures) and outputs of epidemic models and to use this syntax in an existing system called the Apollo Web Services that makes it possible for other computer programs to access epidemic models; and (4) to increase the capacity to run epidemic models on supercomputers so as to demonstrate the value of the work of the first three aims.
Role: Corresponding PI