Approved by the Regents
May 19, 2022

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF INTERNAL MEDICINE

Michael W. Sjoding, M.D., M.Sc., assistant professor of internal medicine, Department of Internal Medicine, Medical School, is recommended for promotion to associate professor of internal medicine, with tenure, Department of Internal Medicine, Medical School.

Academic Degrees:

M.Sc.	2015	University of Michigan
M.Sc.	2015	University of Michigan
M.D.	2008	Loyola University
B.S.	2004	Valparaiso University

Professional Record:

2017 - Present	Assistant Professor of Internal Medicine, University of Michigan
2015 - 2017	Clinical Lecturer of Internal Medicine, University of Michigan

Summary of Evaluation:

Teaching: Dr. Sjoding has been actively involved in teaching and mentoring throughout his training and career. As a former chief resident, his teaching skills are superb. Dr. Sjoding considers teaching central to his research and an important part of his clinical practice. His instruction occurs in the clinical setting, including the Critical Care Medicine Unit (CCMU) and in the pulmonary clinic. The majority of his teaching effort is directed toward one-on-one teaching and mentoring of undergraduate, graduate, and post-graduate students, particularly those from non-clinical backgrounds, working in healthcare research. Dr. Sjoding has worked with numerous undergraduate and graduate students on various research projects in healthcare. He helps students formulate addressable and important research questions and supervise their research, and he also facilitates opportunities for local and national conference presentations and provides career advice. He has formed many notable, long-term mentoring relationships that have resulted in numerous publications. In collaboration with faculty in the Center for Computational Medicine and Bioinformatics, he has also served on the dissertation committee for two students. As an attending in the CCMU for four weeks per year, he provides a supportive environment in what, for many medical students, is their most challenging rotation. Dr. Sjoding's trainee evaluations are outstanding, with many commenting on his enthusiasm, teaching excellence at bedside, and his focus on patient-centered care.

Research: Dr. Sjoding is a superb physician-scientist focused on improving care for patients with acute respiratory disease. His unique expertise in the analysis of longitudinal electronic health records and medical images has been the cornerstone of much of his research. Combining his background in epidemiology/health services research with techniques from machine-learning and data science, he is uniquely positioned to make tremendous advances in this space. His research contributions are focused in two main areas. First, he studies patient care delivery using highly granular health care data. Dr. Sjoding's findings have identified consequential gaps in the care

patients receive and how this impacts health outcomes, such as uncovering that pulse oximeters routinely used in hospital settings are three times as likely to miss clinically significant low oxygen levels in Black patients compared to White patients (*New England Journal of Medicine*, 2020). Second, he utilizes machine-learning to develop new computational tools that both support and improve delivery of care. Notably, his findings have produced a new algorithm to identify Acute Respiratory Distress Syndrome on chest x-ray studies. His expertise has made him a valued member of several team science initiatives. He has ongoing research partnerships with faculty in the Department of Computational Medicine and Bioinformatics, the College of Engineering, the College of Pharmacy, and throughout various departments in the Medical School. His scholarly output is prolific. Since his appointment to assistant professor in 2017, he has produced over 40 peer-reviewed original research publications. Many have been published in leading journals such as *The New England Journal of Medicine*, *Lancet Digital Health*, *Journal of the American Medical Informatics Association*, and the *American Journal of Respiratory and Critical Care Medicine*. Since 2017, his research has been cited over 1,000 times, with 300 citations in the first half of 2021 alone. Dr. Sjoding is the principal investigator or co-principal investigator of two NIH R01 grants, a K01 grant, a Department of Defense grant, and an institutional grant. Most recently, he received a fundable score on a new NIH R01 award and new SBIR proposal.

Recent and Significant Publications:

Sjoding MW, Taylor D, Motyka J, Lee E, Co I, Claar D, McSparron JI, Ansari S, Kerlin MP, Reilly JP, Shashaty MGS, Anderson BJ, Jones TK, Drebin HM, Ittner CAG, Meyer NJ, Iwashyna TJ, Ward KR: Gillies CE. Deep learning to detect acute respiratory distress syndrome on chest radiographs: a retrospective study with external validation. *The Lancet Digit Health* 3(6): e340-348, 2021.

Sjoding MW, Dickson RP, Iwashyna TJ, Gay SE, Valley TS: Racial Bias in Pulse Oximetry Measurement. *N Engl J Med* 383(25): 2477-2478, 2020.

Zeiberg D, Prahlad T, Nallamothu BK, Iwashyna TJ, Wiens J, Sjoding MW. Machine learning for patient risk stratification for acute respiratory distress syndrome. *PLoS On*e 14(3): e0214465, 2019.

Sjoding MW, Gong MN, Haas CF, Iwashyna TJ: Evaluating Delivery of Low Tidal Volume Ventilation in Six ICUs Using Electronic Health Record Data. *Crit Care Med* 47(1): 56-61, 2019.

Sjoding MW, Hofer TP, Co I, Courey A, Cooke CR: Iwashyna TJ. Interobserver Reliability of the Berlin ARDS Definition and Strategies to Improve the Reliability of ARDS Diagnosis. *Chest*. Feb; 153(2): 361- 367, 2018.

Service: Dr. Sjoding is an outstanding clinician who provides patient care and serves as a member of the data analytics and IT work group as part of the larger Precision Health Initiative. He is also a founding member of two University of Michigan groups seeking to bridge the gap between computer science and medicine, the Michigan Center for Health Analytics and Medical Prediction (MiCHAMP) and the e-Health and Artificial Intelligence Program (eHAIL). Nationally, he is an active member of the American Thoracic Society. He has served as a member of the planning committee for the Machine Learning in Healthcare Conference (2020 and 2021), bringing together

clinicians, medical researchers, and computer scientists with the goal of advancing research at the intersection of these fields. He also serves as a peer reviewer for leading industry journals including *Critical Care Medicine*, *CHEST*, *Annals of the American Thoracic Society*, *Lancet*, and the *American Journal of Respiratory and Critical Care Medicine*, among others. In recognition of his leadership and expertise, he was named a 2020 recipient of the Department of Internal Medicine's Early Career Endowment Award. In 2021, he received an Early Career Achievement Award from the American Thoracic Society.

External Reviewers:

Reviewer A: "In reviewing Dr. Sjoding's complete body of work, it is clear that he has developed a focused area of research by applying bioinformatic techniques to EHR data in critical illness. This is a relatively new and vitally important research focus and Dr. Sjoding has already made many valuable contributions to the field through publication of numerous studies that have had an impact of the field. In particular, his work on racial biases in measurement of pulse oximetry (PMC7808260) has had a tremendous impact on the field including in my own practice…In summary, Dr. Sjoding has a focused an impactful body of work, has demonstrated robust and sustained funding for his research program, is committed to service both locally and nationally and has established a national reputation as a leader in the field on bioinformatics in the ICU."

Reviewer B: "It is with the highest level of enthusiasm that I provide this letter of strongest commendation and support for Michael W Sjoding, M.D… Dr. Sjoding has, during tenure at University of Michigan established himself as an emerging, internationally-recognized, expert in the epidemiology and outcomes of critical illness and related health services research…it is incontrovertible that Michael is both a highly innovative, productive and creative physician-scientist and is a highly cited author in this field. His leadership both domestically and internationally, coupled with high-impact research productivity are of the first order and are proving to be highly influential in the field…Dr. Sjoding embodies the highest and most valued attributes of a clinician-scientist. Those of enduring inquisitiveness and humility. While these attributes may not be reflected in his CV, I can attest that on every occasion I have been privileged to interact with Michael, I have been left with the enduring sense that he epitomizes these two essential traits. I am thus compelled to recommend his candidacy most strongly and without hesitation."

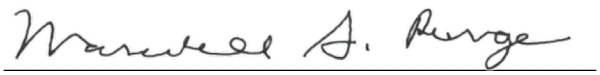
Reviewer C: "The rigor, novelty, and impact of Dr. Sjoding's research has been recognized by leading medical journals, including the aforementioned New England Journal of Medicine and Lancet Digital Health as well as American Journal of Respiratory and Critical Care Medicine, Chest, Nature Medicine, and JAMA, and by federal funding agencies, including the US National Institutes of Health and the US Department of Defense…His service on international, national, and institutional committees, numerous presentations, teaching activities, and visiting professorships indicate widespread recognition of the value of his research and his willingness to serve and teach others."

Reviewer D: "His contributions to the field are extraordinary. Using machine learning, Dr. Sjoding has derived and validated two approaches for refining the identification of ARDS and the interpretation of the chest radiograph. These are key advances as ARDS remains an underrecognized and undertreated syndrome internationally and traditional process improvement

techniques have failed to improve the situation. A transformative approach is needed and Dr. Sjoding's field-leading work will indeed be transformative and improve public health… Dr. Sjoding represents the University of Michigan with distinction and class. He is a growing superstar who has already poised to make international contributions."

Reviewer E: "Dr. Sjoding was given an Early Career Achievement Award from the American Thoracic Society. It has been my impression that recipients of these ATS awards are rising stars in their respective fields. Dr. Sjoding's research productivity and impact certainly would attest to that…In addition to Dr. Sjoding's busy and productive research career, he has made significant contributions in service to his university and the community. This is notable for participating on several prominent committees with both the ATS and NIH…In summary, Dr. Sjoding is a very productive researcher whose studies have provided new insights into ARDS…Therefore, with enthusiasm I strongly support Dr. Sjoding's promotion to the rank of Associate Professor with tenure."

Summary of Recommendation:
Dr. Sjoding is an exceptional physician scientist, effective teacher, and outstanding clinician who continues to excel in academic medicine. His passion for learning and dedication to enhancing healthcare performance measurement programs make him an ideal candidate for success. I am pleased to recommend Michael W. Sjoding, M.D., M.Sc. for promotion to associate professor of internal medicine, with tenure, Department of Internal Medicine, Medical School.



Marschall S. Runge, M.D., Ph.D.
Executive Vice President for Medical Affairs
Dean, Medical School

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