

Volume 39, No 8

ICHE

AUGUST 2018

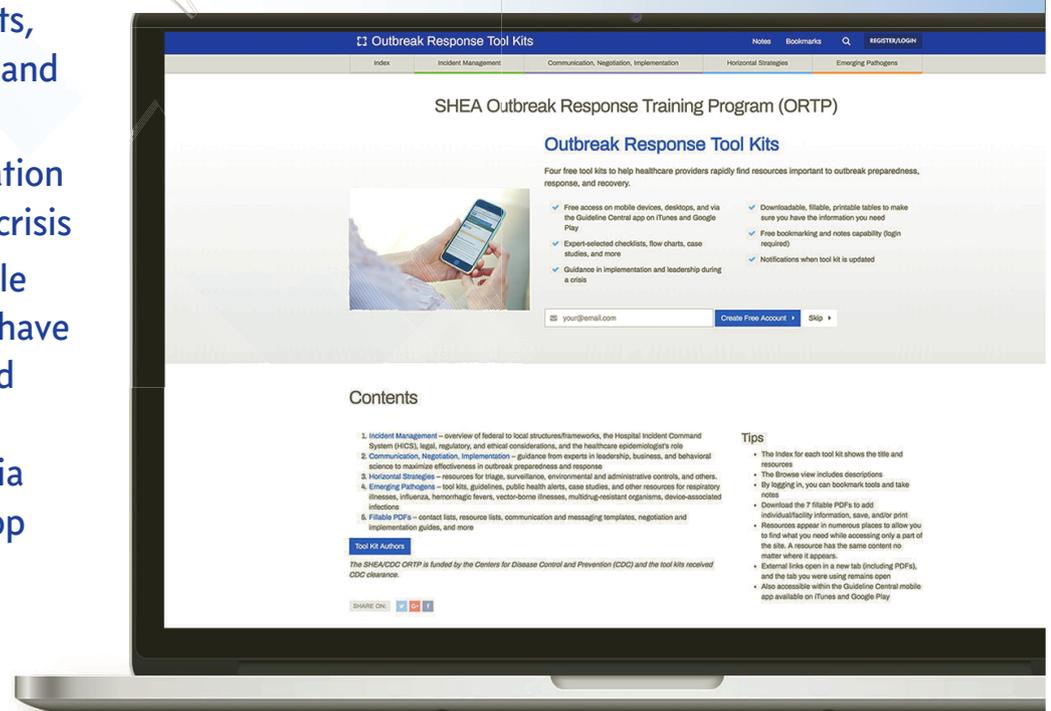


JOHN SNOW & THE BROAD
STREET PUMP

OUTBREAK RESPONSE TOOL KITS

The SHEA/CDC Outbreak Response Training Program (ORTP) tool kits are your source for quick, concise information and resources to help you and your facility effectively manage outbreaks.

- Expert-selected checklists, flow charts, summaries, and diagrams
- Guidance in implementation and leadership during a crisis
- Downloadable and fillable tables to make sure you have the information you need
- Free access on mobile devices, desktops, and via the Guideline Central app
- And more...



View the tool kits online
ORTP.GuidelineCentral.com

CONTENTS

Original Articles

- 897** Centers for medicare and medicaid services hospital-acquired conditions policy for central line-associated bloodstream infection (CLABSI) and catheter-associated urinary tract infection (CAUTI) shows minimal impact on hospital reimbursement
Michael S. Calderwood, Alison Tse Kawai, Robert Jin and Grace M. Lee
- 902** Reducing indwelling urinary catheter use through staged introduction of electronic clinical decision support in a multicenter hospital system
Brett E. Youngerman, Hojjat Salmasian, Eileen J. Carter, Michael L. Loftus, Rimma Perotte, Barbara G. Ross, E. Yoko Furuya, Robert A. Green and David K. Vawdrey
- 909** Transmission of *Clostridium difficile* from asymptotically colonized or infected long-term care facility residents
Curtis J. Donskey, Venkata C. K. Sunkesula, Nimalie D. Stone, Carolyn V. Gould, L. Clifford McDonald, Matthew Samore, JeanMarie Mayer, Susan M. Pacheco, Annette L. Jencson, Susan P. Sambol, Laurica A. Petrella, Christopher A. Gulvik and Dale N. Gerding
- 917** Increased environmental sample area and recovery of *Clostridium difficile* spores from hospital surfaces by quantitative PCR and enrichment culture
Kevin Antoine Brown, Laura K. MacDougall, Kim Valenta, Andrew Simor, Jennie Johnstone, Samira Mubareka, George Broukhanski, Gary Garber, Allison McGeer and Nick Daneman
- 924** Cost-effectiveness of three different strategies for the treatment of first recurrent *Clostridium difficile* infection diagnosed in a community setting
Simon W. Lam, Elizabeth A. Neuner, Thomas G. Fraser, David Delgado, and Donald B. Chalfin
- 931** Validation of semiautomated surgical site infection surveillance using electronic screening algorithms in 38 surgery categories
Sun Young Cho, Doo Ryeon Chung, Jong Rim Choi, Doo Mi Kim, Si-Ho Kim, Kyungmin Huh, Cheol-In Kang and Kyong Ran Peck
- 936** Outpatient antimicrobial stewardship targets for treatment of skin and soft-tissue infections
Preeti Jaggi, Ling Wang, Sean Gleeson, Melissa Moore-Clingenpeel and Joshua R. Watson
- 941** Assessing the impact of antibiotic stewardship program elements on antibiotic use across acute-care hospitals: an observational study
Bradley J. Langford, Julie Hui-Chih Wu, Kevin A. Brown, Xuesong Wang, Valerie Leung, Charlie Tan, Gary Garber and Nick Daneman
- 947** A retrospective analysis of adverse events among patients receiving daptomycin versus vancomycin during outpatient parenteral antimicrobial therapy
Gregory M. Schrank, Sharon B. Wright, Westyn Branch-Elliman and Mary T. LaSalvia
- 955** The effect of timing of oseltamivir chemoprophylaxis in controlling influenza A H3N2 outbreaks in long-term care facilities in Manitoba, Canada, 2014-2015: a retrospective cohort study
Davinder Singh, Depeng Jiang, Paul Van Caesele and Carla Loeppky

Cover image: A replica of the original 1854 Broad Street Pump has stood at the corner of Broadwick and Lexington Streets in Soho, London since 1992. The John Snow Pub can be seen in the background. Image “John Snow memorial and pub,” copyright Justinc - made available under a Creative Commons Attribution-Share Alike 2.0 Generic license.

961 Design strategies to improve healthcare worker safety in biocontainment units: learning from ebola preparedness
Jennifer R. DuBose, Zorana Matić, Maria Fernanda Wong Sala, Joel M. Mumma, Colleen S. Kraft, Lisa M. Casanova, Kimberly Erukunuakpor, Francis T. Durso, Victoria L. Walsh, Puja Shah, Craig M. Zimring and Jesse T. Jacob, for the CDC Prevention Epicenters Program

968 Visitor restriction policies and practices in children's hospitals in North America: results of an Emerging Infections Network Survey
Alice L. Pong, Susan E. Beekmann, Mekleet M. Faltamo, Philip M. Polgreen and Andi L. Shane; for the pediatric members of the Infectious Diseases Society of America Emerging Infections Network

Review

972 Wastewater drains: epidemiology and interventions in 23 carbapenem-resistant organism outbreaks
Philip C. Carling

Concise Communications

980 Improved rates of antimicrobial stewardship interventions following implementation of the Epic antimicrobial stewardship module
Natasha N. Pettit, Zhe Han, Anish R. Choksi, Angella Charnot-Katsikas, Kathleen G. Beavis, Vera Tesic, Palak Bhagat, Cynthia T. Nguyen, Allison H. Bartlett and Jennifer Pisano

983 Driving antimicrobial use improvement: attitudes of providers of adult hospital care on optimal attribution and feedback
Tara H. Lines, Whitney J. Nesbitt, and George E. Nelson

986 Implementation of an institution-specific antimicrobial stewardship smartphone application
Heather L. Young, Katherine C. Shihadeh, Alisha A. Skinner, Bryan C. Knepper, Jeffrey Sankoff, Jeremy Voros, Timothy C. Jenkins

989 Rate of positive cultures necessitating definitive treatment in patients receiving empiric vancomycin therapy
C. Dustin Waters and Joshua Caraccio

991 Appropriateness of antibiotic prescriptions for acute sinusitis and pharyngitis in an integrated healthcare system
Lakshmi Chauhan, Heather Young, Bryan C. Knepper, Katherine C. Shihadeh and Timothy C. Jenkins

994 Variability in determining sepsis time zero and bundle compliance rates for the Centers for Medicare and Medicaid Services SEP-1 measure
Chanu Rhee, Sarah R. Brown, Travis M. Jones, Cara O'Brien, Anupam Pande, Yasir Hamad, Amy L. Bulger, Kathleen A. Tobin, Anthony F. Massaro, Deverick J. Anderson, David K. Warren and Michael Klompas, for the CDC Prevention Epicenters Program

997 A cluster of *Chryseobacterium indologenes* cases related to drainage water in intensive care units
Mireia Cantero, Lina M. Parra, Elena Muñoz, Reyes Iranzo, Maria Isabel Sánchez-Romero, Jesús Oteo, and Angel Asensio

1000 Design and validation of an anatomically based assessment scale for handwashing with alcohol-based hand rub
Daniel Aiham Ghazali, Julie Thomas, Elsa Deilhaes, Catherine Laland, Sarah Thévenot, Jean Pierre Richer and Denis Oriot

1003 Healthcare personnel vaccination policies in Michigan long-term care facilities
Lynsey M. Kimmins, Cristi A. Bramer, Jacklyn L. Chandler and Adam L. Hart

Research Briefs

1006 Visitor screening and staff sick leave policies in US hospitals
Eric J. Chow, Michael A. Smit and Leonard A. Mermel

1008 Peripheral arterial catheter colonization in cardiac surgical patients
Andrew T. Levinson, Kimberle C. Chapin, Lindsay LeBlanc and Leonard A. Mermel

Letters to the Editor

- 1010** Would a rose by any other name really smell as sweet? Framing our work in infection prevention
Shelley K. Summerlin-Long, David J. Weber, Lauren M. DiBiase, Mark O. Buchanan, Emily E. Sickbert-Bennett and Department of Hospital Epidemiology, University of North Carolina Hospitals
- 1011** Promoting an action plan for devices in the emergency department—does it impact catheter duration?
Bernard Surial, Andrew Atkinson, Susanne Nüesch, Joerg C. Schefold and Jonas Marschall
- 1013** Clinical outcome, healthcare cost and length of hospital stay among patients with bloodstream infections and acute leukemia in a cancer center in Eastern India
Chelsea Elizabeth Muennichow, Gaurav Goel, Arpita Bhattacharyya, Reena Nair, Mammen Chandy and Sanjay Bhattacharya
- 1015** Challenges in identifying *Candida auris* in hospital clinical laboratories: a need for hospital and public health laboratory collaboration in rapid identification of an emerging pathogen
Amanda J. Durante, Meghan H. Maloney, Vivian H. Leung, Jafar H. Razeq and David B. Banach
- 1016** Nosocomial impact of prevalent β -lactamases from the community enterobacteriaceae: what to do when the resistance doesn't go your way
Leandro Reus Rodrigues Perez
- 1018** Alcohol-based hand rubs must meet the requirements of EN 1500
Sven Eggerstedt, Patricia Fliß, Erika Mönch and Christiane Ostermeyer
- 1019** Agreement with employer influenza vaccination requirements among US healthcare personnel during the 2016–2017 season
Marie A. de Perio, Xin Yue, A. Scott Laney, Stacie M. Greby and Carla L. Black

Corrigendum

- 1021** Clinical outcome, healthcare cost and length of hospital stay among patients with bloodstream infections and acute leukemia in a cancer center in Eastern India — CORRIGENDUM

MICROBIAL SURVEILLANCE TESTING MADE EASY

Healthmark offers the One-Two Punch to Identify and Document the Efficacy of Your Endoscope Reprocessing

SCREEN WITH THE NOW! TEST

*Rapid Indicator of
Gram-Negative bacteria*

Immediate, practical screening test. Simply flush the lumen of a flexible endoscope, such as a duodenoscope, and follow the procedure for gram-negative bacteria detection in less than 12 hours.

< 10 CFU



 **healthmark**

AUDIT WITH THE FLEXIBLE ENDOSCOPE SAMPLING KIT

Surveillance tool for the random testing of duodenoscopes in compliance with CDC guidelines - In association with Nelson Laboratories



A simple and complete kit. After flushing and brushing the lumen and elevator mechanism of a duodenoscope, simply follow the procedure to have the sample solution & brush heads quickly sent to Nelson Laboratories - the leader in independent testing of flexible endoscopes. All tools are included for testing and shipment.


NELSON
LABORATORIES

An Official Publication of the Society for Healthcare Epidemiology of America

EDITOR

Suzanne F. Bradley, MD • Ann Arbor, MI

DEPUTY EDITOR

Carol Chenoweth, MD • Ann Arbor, MI

SENIOR ASSOCIATE EDITORS

C. Glen Mayhall, MD • Galveston, TX

Gina Pugliese, RN, MS • Chicago, IL

William Schaffner, MD • Nashville, TN

ASSOCIATE EDITORS

David P. Calfee, MD, MS • New York, NY

Lindsay E. Nicolle, MD • Winnipeg, Manitoba

Trevor C. Van Schooneveld, MD • Omaha, NE

David Weber, MD, MPH • Chapel Hill, NC

STATISTICS CONSULTANTS

Jon P. Furuno, PhD • Portland, OR

Jessina C. McGregor, PhD • Portland, OR

MANAGING EDITOR

Gennifer Levey • New York, NY

PAST EDITORS

Infection Control

Richard P. Wenzel, MD, 1980-1987 (vols. 1-8)

Infection Control & Hospital Epidemiology

Richard P. Wenzel, MD, 1988-1992 (vols. 9-13)

Michael D. Decker, MD, 1993-2001 (vols. 14-22)

Barry M. Farr, MD, 2002-2004 (vols. 23-25)

William R. Jarvis, MD, 2005-2006 (vols. 26 and 27)

EDITORIAL ADVISORY BOARD

Deverick Anderson, MD, MPH • Durham, NC

Anucha Apisarnthanarak, MD • Pratumthani, Thailand

Lennox Archibald, MD, FRCP • Alachua, FL

Shailen Banerjee, PhD • Atlanta, GA

Elise M. Beltrami, MD, MPH • Atlanta, GA

Jo Anne Bennett, RN, PhD • New York, NY

David Birnbaum, PhD, MPH • Sidney, BC

Marc Bonten, MD • Utrecht, Netherlands

Christian Brun-Buisson, MD • Creteil, France

John P. Burke, MD • Salt Lake City, UT

David P. Calfee, MD, MS • New York, NY

Yehuda Carmeli, MD, MPH • Tel Aviv, Israel

Donald E. Craven, MD • Burlington, MA

Christopher Crnich, MD, MS • Madison, WI

Erika D'Agata, MD, MPH • Boston, MA

Daniel Diekema, MD • Iowa City, IA

Erik Dubberke, MD, MSPH • St. Louis, MO

Charles E. Edmiston, Jr., PhD • Milwaukee, WI

Mohamad Fakhri, MD, MPH • Grosse Pointe Woods, MI

Petra Gastmeier, MD • Berlin, Germany

Jeffrey Gerber, MD, PhD • Philadelphia, PA

Dale N. Gerding, MD • Hines, IL

Donald A. Goldmann, MD • Boston, MA

Nicholas Graves, PhD • Brisbane, Australia

Donna Haiduvan, RN, PhD, CIC • Tampa, FL

Anthony D. Harris, MD, MPH • Baltimore, MD

Elizabeth Henderson, PhD • Calgary, AB

David K. Henderson, MD • Bethesda, MD

Loreen A. Herwaldt, MD • Iowa City, IA

Peter N. R. Heseltine, MD • Brea, CA

John A. Jernigan, MD, MS • Atlanta, GA

Mini Kamboj, MD • New York, NY

Carol A. Kauffman, MD • Ann Arbor, MI

James T. Lee, MD, PhD • St. Paul, MN

L. Clifford McDonald, MD • Atlanta, GA

Allison McGeer, MD • Toronto, ON

Leonard A. Mermel, DO, ScM • Providence, RI

Robert R. Muder, MD • Pittsburgh, PA

Linda Mundy, MD • Collegeville, PA

Joseph M. Mylotte, MD, CIC • Buffalo, NY

Jan Evans Patterson, MD • San Antonio, TX

David A. Pegues, MD • Philadelphia, PA

Didier Pittet, MD, MS • Geneva, Switzerland

Isaam Raad, MD • Houston, TX

Manfred L. Rotter, MD, DipBact • Vienna, Austria

William A. Rutala, PhD, MPH • Chapel Hill, NC

Lisa Saiman, MD, MPH • New York, NY

Sanjay Saint, MD, MPH • Ann Arbor, MI

Sorana Segal-Maurer, MD • Flushing, NY

Lynne M. Sehulster, PhD • Atlanta, GA

John A. Sellick, DO • Amherst, NY

Andrew E. Simor, MD • Toronto, ON

Philip W. Smith, MD • Omaha, NE

Kurt Stevenson, MD, MPH • Columbus, OH

Nimalie Stone, MD • Atlanta, GA

Thomas Talbot, MD, MPH • Nashville, TN

Paul Tambyah, MBBS • Singapore

William Trick, MD • Chicago, IL

Antoni Trilla, MD, PhD • Barcelona, Spain

Robert A. Weinstein, MD • Chicago, IL

Andreas Widmer, MD, MS • Basel, Switzerland

Marcus Zervos, MD • Detroit, MI

Infection Control & Hospital Epidemiology (ISSN 0899-823X) is published monthly by Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA.

Editorial Office

Communications should be addressed to the Editor, *Infection Control & Hospital Epidemiology*, One Liberty Plaza, New York, NY 10006 (email: iche.managingeditor@cambridge.org). Contributors should consult the Instructions for Contributors, which is available at the journal's Web site.

Advertising

Please direct advertising inquiries to M. J. Mrvica Associates, 2 West Taunton Avenue, Berlin, NJ 08009 (e-mail: mjmrvica@mrvica.com; telephone: 856-768-9360, fax: 856-753-0064). Publication of an advertisement in *Infection Control & Hospital Epidemiology* does not imply endorsement of its claims by the Society for Healthcare Epidemiology of America, by the Editor, or by Cambridge University Press.

Permissions

Articles may be copied or otherwise reused without permission only to the extent permitted by Sections 107 and 108 of the US Copyright Law. Permission to copy articles for personal, internal, classroom, or library use may

be obtained from the Copyright Clearance Center (<http://www.copyright.com>, email: info@copyright.com). For all other uses, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, please contact Cambridge University Press. Full details may be found at: www.cambridge.org/about-us/rights-permissions.

Subscriptions

The individual subscription rate for 2018 is \$260. Individuals have the option to order directly from Cambridge University Press. Institutional print + electronic and e-only subscriptions are available from Cambridge University Press and include unlimited online access; rates are tiered according to an institution's type and research output and may be reviewed at the journal's CJO homepage: cambridge.org/ICHE.

Please direct subscription inquiries and requests for back issues to Customer Services at Cambridge University Press, e-mail: subscriptions_newyork@cambridge.org (USA, Canada, and Mexico) or journals@cambridge.org (outside of USA, Canada, and Mexico).

Postmaster: Send address changes to *Infection Control & Hospital Epidemiology*, Cambridge University Press, One Liberty Plaza, New York, NY 10006 USA.

About the cover:



Since 2015, the cover format of each volume of *Infection Control & Hospital Epidemiology* has been designed to honor one of the many professionals throughout history who not only recognized how disease might be spread but also how to apply those principles to reduce healthcare-associated infections.

John Snow (1813–1858) was 1 of 9 children born to a working-class family in York, England. At the age of 14, he was apprenticed as a surgeon-apothecary with a family friend in Newcastle. He was sent to tend the afflicted in a nearby mining town during a cholera outbreak in 1832. He pursued his medical degree at the University of London, with the sponsorship of a wealthy uncle, and he initially set up a general practice in Soho. He gained fame as a practitioner of the new discipline of anesthesia and tended to Queen Victoria during the births of her children.

On August 24, 1854, a baby died of cholera on Broad Street near Soho. Shortly thereafter, 700 deaths from cholera occurred within a radius of 250 yards, and Snow happened to live nearby. As an anesthetist, he recognized how gases dissipated, and he rejected the prevailing dogma that cholera was spread through the inhalation of atmospheric vapors from decaying material because it would not explain how patients were affected miles away from the source. Snow hypothesized that water, contaminated with some cholera agent in feces, was the more likely explanation.

Using epidemiological principles, he identified who was affected using death certificates and where the illness was acquired (e.g., where case patients lived), then he determined what water supply they had used. He discovered that most households with a cholera case obtained water from the Broad Street pump. Snow ordered that the pump handle be removed. A local curate, Henry Whitehead, initially sought to disprove Snow's suspicions through further surveillance. Instead, Whitehead found that 8-fold more case patients had drunk from the pump than had not. Furthermore, he revealed that deaths occurred more often among residents who resided closest to the pump than in houses located farther away or that used a different water source. Ultimately, a leak between the Broad Street pump and a neighboring cesspool was discovered.

John Snow continued to carefully study the relationship between water contamination and cholera. Unfortunately, his work in epidemiology was ignored or pilloried in editorials in major journals. Snow would not live long enough to be recognized as a founder of modern epidemiology; he died of "apoplexy" or stroke at the age of 45 years. The John Snow Inn and a replica of the Broad Street pump can still be found in what is now called Broadwick Street in Soho, central London.

Cover image: A replica of the original 1854 Broad Street Pump has stood at the corner of Broadwick and Lexington Streets in Soho, London since 1992. The John Snow Pub can be seen in the background. Image "John Snow memorial and pub," copyright Justinc - made available under a Creative Commons Attribution-Share Alike 2.0 Generic license.

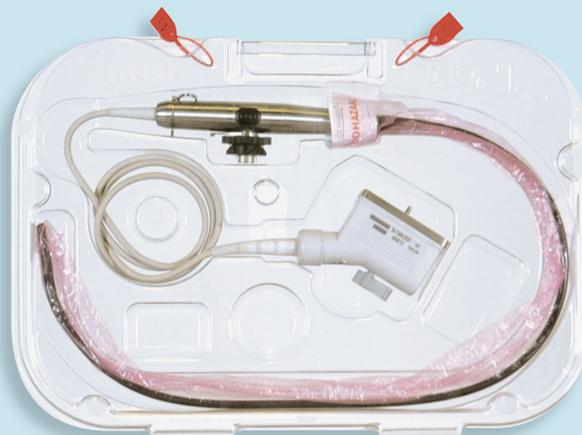
TPorter[®]

TEE TRANSPORT DEVICE

TPorter TEE Ultrasound Probe Transportation and Procedure Case is designed to effectively and securely move high-level disinfected TEE ultrasound probes to the procedure area and then return the biologically soiled TEE ultrasound probe for reprocessing. TPorter features a variety of molded compartments to accommodate the TEE ultrasound probe, bite block(s), a PullUp[™] Bio-Barrier Sleeve and a TEEzyme[®] enzymatic sponge.



Procedure Transportation Case



Soiled Transportation Case



TPorter procedure case in use

Designed to transport all major TEE probe brands

CS Medical

2179 East Lyon Station Road • Creedmoor, NC 27522
Toll Free: 877.255.9472 • Phone: 919.255.9472
www.csmedicalllc.com • info@csmedicalllc.com

Infectious Disease Physician Hospital Epidemiologist

The Division of Infectious Diseases at Mayo Clinic, Jacksonville, Florida invites applications for a position in clinical infectious disease and hospital epidemiology.

Mayo Clinic is seeking a board certified academic infectious disease physician who is trained in hospital epidemiology and infection prevention and control. Qualified candidates are required to have Infectious Diseases fellowship training and be Board Certified/ Board Eligible in Infectious Diseases.

Evidence of academic productivity and commitment to research and education in infectious disease and hospital epidemiology is expected. The position will include an academic appointment with the Mayo Clinic College of Medicine. The division supports an ACGME-accredited fellowship in general infectious diseases.

Our group practice focuses on providing high quality, compassionate medical care. We are the largest integrated, not-for-profit medical group practice in the world with approximately 3,800 physicians and scientists across all locations. This unique working environment brings together the best in patient care, groundbreaking research and innovative medical education. We offer a highly competitive compensation package, which includes exceptional benefits, and we have been recognized by *FORTUNE* magazine as one of the top 100 “Best Companies to Work For”.

Please visit [Mayocareers.com/ICHEHE](https://www.mayocareers.com/ICHEHE) to apply online and learn more about Mayo Clinic and the vast array of opportunities that await you.

*Heal the sick,
Advance the science,
Share the knowledge.*



©2018 Mayo Foundation for Medical Education and Research. Post offer/pre-employment drug screening is required. Mayo Clinic is an equal opportunity educator and employer (including veterans and persons with disabilities).