



MACQUARIE
University
SYDNEY · AUSTRALIA

Understanding WOMBAT: A Method for Observing & Evaluating Clinical Work

Dr Mirela Prgomet

Australian Institute of Health Innovation

25 November 2025

About Me



Senior Research Fellow

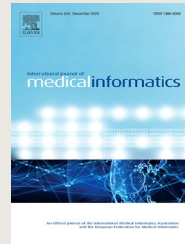
Centre for Health Systems and Safety Research

My research seeks to evaluate the impact of digital health technologies on the efficiency, effectiveness, and safety of clinical work practices and patient care.



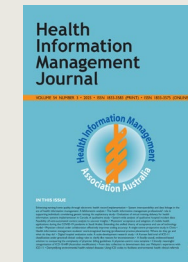
Co-Chair

*IMIA Working Group on
Technology Assessment
and Quality Development*



Associate Editor

*International Journal of
Medical Informatics*



Editorial Board Member

*Health Information
Management Journal*



Member

*WHO Working Group
on Evaluation of
AI for Health*

About AIHI

Australian Institute of Health Innovation

Our goal is to co-create high-impact health services and systems research that drives positive change in policy, practice and behaviour for the benefit of all.



MACQUARIE
University
SYDNEY • AUSTRALIA

Australian Institute of Health Innovation

AIHI DIRECTORS



MACQUARIE
University

AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION



Professor
**Jeffrey
Braithwaite**

Founding
Director, AIHI
and Director,
Centre for
Healthcare
Resilience and
Implementation
Science
(CHRIS)



Professor
**Johanna
Westbrook**

Director,
Centre for
Health
Systems and
Safety
Research
(CHSSR)



Professor
**Enrico
Coiera**

Director,
Centre for
Health
Informatics
(CHI)



Professor
**Henry
Cutler**

Director,
Macquarie
University
Centre for the
Health
Economy
(MUCHE)

Centre for Healthcare Resilience and Implementation Science (CHRIS)

CHRIS provides evidence-based solutions to improve healthcare systems locally and globally.

Tackle urgent health challenges – rising chronic disease, climate-related pressures, mental health needs and patient safety risks – by generating actionable insights and practical innovations.

- complex systems and implementation science
- health and societal outcomes
- health system sustainability
- human factors and resilience
- international healthcare reform
- learning health systems
- observatory on the future of healthcare
- patient safety and appropriateness of care



Prof Jeffrey Braithwaite

CHI research the design and safe use of AI and digital technologies in healthcare.

Pivotal role in the national conversation on how best to take advantage of AI in building a better health system, and in navigating the challenges this brings.

- AI for precision medicine
- AI systems safety
- climate change and digital health
- consumer informatics
- interactive clinical AI



Prof Enrico Coiera

Macquarie University Centre for the Health Economy (MUCHE)

MUCHE investigate the health economy at the macro level, with a commitment to improving healthcare system outcomes and value.

The Centre primarily consists of specialist health economists, working closely with teams with multi-disciplinary skills, to solve problems within health and human services.

- aged care
- health preference
- health technology assessment
- integrated care
- mental health
- Pharmaceutical (PBAC) and Medical Services (MSAC) evaluations



Prof Henry Cutler

Centre for Health Systems and Safety Research (CHSSR)



MACQUARIE
University

**AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION**

CHSSR is focused on improving the safety, quality and efficiency of healthcare by responding to critical challenges in health systems – including technological complexity, patient safety risks and mounting pressures on the health and aged care workforce.

Investigate how human, organisational and technological systems interact to shape care delivery across hospitals, aged care and community settings.

- aged care evaluation and research
- diagnostic informatics
- health analytics and patient safety
- healthcare engagement and equity research
- medication safety and electronic decision support



Prof Johanna Westbrook

AIHI Snapshot

2024



MACQUARIE
University

AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION



314

Researchers, Visiting Fellows
and Professional Staff



66

Medical Doctor Research
Program Candidates



65

Graduate Research
Candidates (MRes and PhD)



\$58 million

Enterprise value of projects
under AIHI management



161

Research projects
under AIHI management



514

Research publications
in 2024

As at 08/11/2019



AIHI
IMPACT

Our research has broad impact

A selection.



MACQUARIE
University
SYDNEY • AUSTRALIA



AIHI

IMPACT

World first benchmarking with CareTrack studies

A suite of internationally significant studies provides world first benchmarking on the level of appropriate care delivered to Australian adults, children and people in aged care.



MACQUARIE
University
SYDNEY • AUSTRALIA

AIHI
IMPACT

National leadership for AI in healthcare

A network of academics, IT experts and clinicians established to optimise Australia's AI in healthcare capability safely and sustainably—the Australian Alliance for Artificial Intelligence in Healthcare.



MACQUARIE
University
SYDNEY · AUSTRALIA

AIHI

IMPACT

World leading medication safety research

Built the national evidence base on the effects of electronic medication management systems. Revolutionised methods and practices for measuring medication safety. Disseminated strategies for optimising medication technologies.



MACQUARIE
University
SYDNEY · AUSTRALIA



AIHI

IMPACT

Economic evaluation of medicines and medical services

Evaluating medicines, vaccines and medical services before they are listed on the Pharmaceutical Benefits Scheme and the Medicare Benefits Schedule.

We are one of only seven academic groups in Australia contracted for this work.



MACQUARIE
University
SYDNEY • AUSTRALIA



AIHI

IMPACT

Adverse event analysis and reporting

Leading in the analysis and reporting of adverse event data across hospital, allied health and aged care settings in Australia and the UK, including among high-risk populations. Our inclusion of patients and families with lived experience and clinicians, along with the use of AI, is driving innovation across this field.



MACQUARIE
University
SYDNEY • AUSTRALIA



AIHI

IMPACT

Dedicated aged care evaluation and research

We are unlocking data with powerful analytics for aged care providers, provided expert witness to the Royal Commission into Aged Care Quality and Safety and delivered new tools that are being commercially rolled out across the sector.



MACQUARIE
University
SYDNEY • AUSTRALIA

The background of the slide features a photograph of three individuals in an indoor setting. On the left, a person is seen from the back, wearing a dark blue t-shirt. In the center, a woman with dark hair, wearing a dark blue turtleneck sweater and a name tag, is smiling and holding a dark brown paper cup. To her right, another woman wearing a pink hijab and a light pink sweater is also smiling. The background is slightly blurred, showing a warm-toned wall and a window.

AIHI
IMPACT

Supporting person-centred research

Inviting people with lived experience to be at the centre of our research journey from conception to implementation and evaluation with the AIHI Consumer Engagement Panel and project specific groups.



MACQUARIE
University
SYDNEY • AUSTRALIA



AIHI

IMPACT

Leading 152 countries on health system reform

Establishing a research collaboration of 152 countries to produce a book series on international health reform resulting in invitations to present at numerous conferences and to governing agencies around the world.



MACQUARIE
University
SYDNEY AUSTRALIA

We Collaborate Internationally



MACQUARIE
University

**AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION**



36% of AIHI publications involve international collaborations

Why not visit or do a PhD in a highly collaborative and successful research environment in Australia

Contact me to find out more





Wombat – Fun Facts

Wombats are the only known mammals to produce cubic droppings, which helps them stay in place to mark their territory.

It can take them up to two weeks to digest a single meal, which helps them conserve energy.

Despite their stout build, wombats can run at a fast pace of up to 40 km/h for short bursts.

A group of wombats is called a "wisdom".



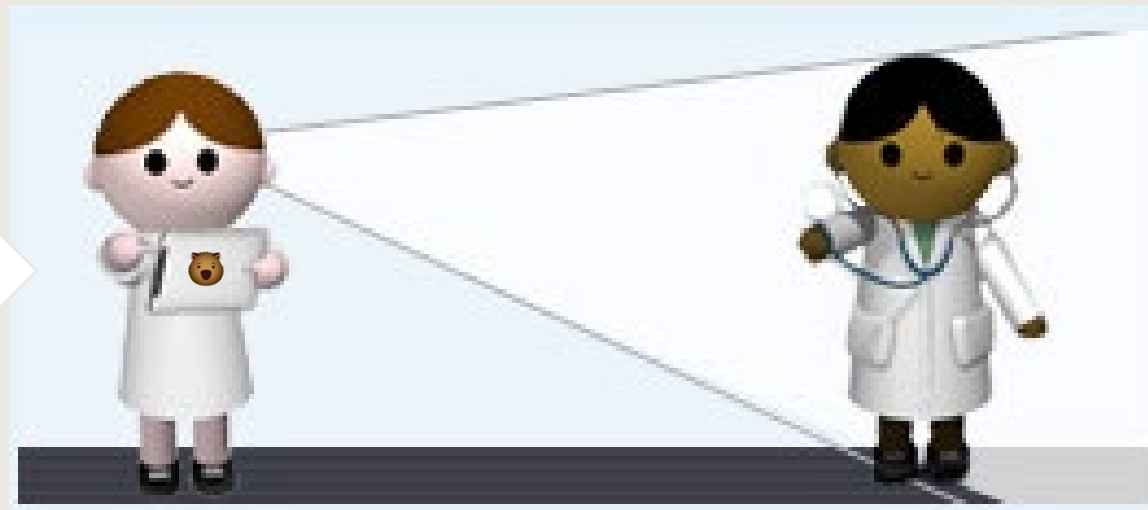
WORK OBSERVATION METHOD BY ACTIVITY TIMING

*research tool designed to capture the complexity of clinical work
through direct observational time and motion studies*

OBSERVER

PARTICIPANT

Independent
observer
records
actions of
participant



Images source: <https://lopetegui.net>

Why was WOMBAT developed?

Developed to provide a reliable method for investigating work and communication pattern changes following introduction of clinical information systems.

The aim was to advance existing research methods, to capture multiple dimensions of work, interruptions and multi-tasking.

Quality data about how systems enhance or disrupt work and communication patterns, to identify and address any possible negative outcomes and take advantage of the benefits information technology presents.



History of WOMBAT – 1.0



MACQUARIE
University

AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION

Developed in 2006, the first version of WOMBAT (WOMBAT 1.0) was designed for use on a PDA.

Allowed observers record four fixed dimensions of work activities (what task, with whom, where, and how).

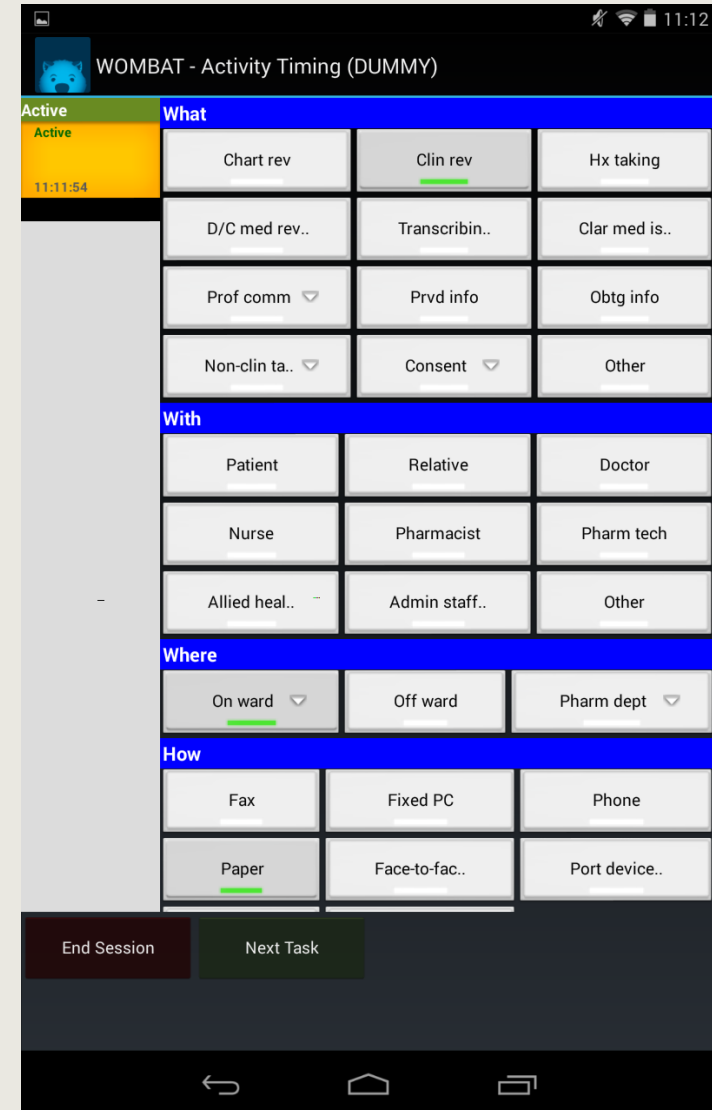


History of WOMBAT – 2.0

WOMBAT 2.0 redesigned in 2011 for use on Android tablets, with the aim of allowing the tool to be used by research teams across the world.

Flexibility to create custom data collection templates that could include the original four dimensions or different/additional dimensions and variables.

Allowed interruptions and multitasking to be recorded in greater detail.

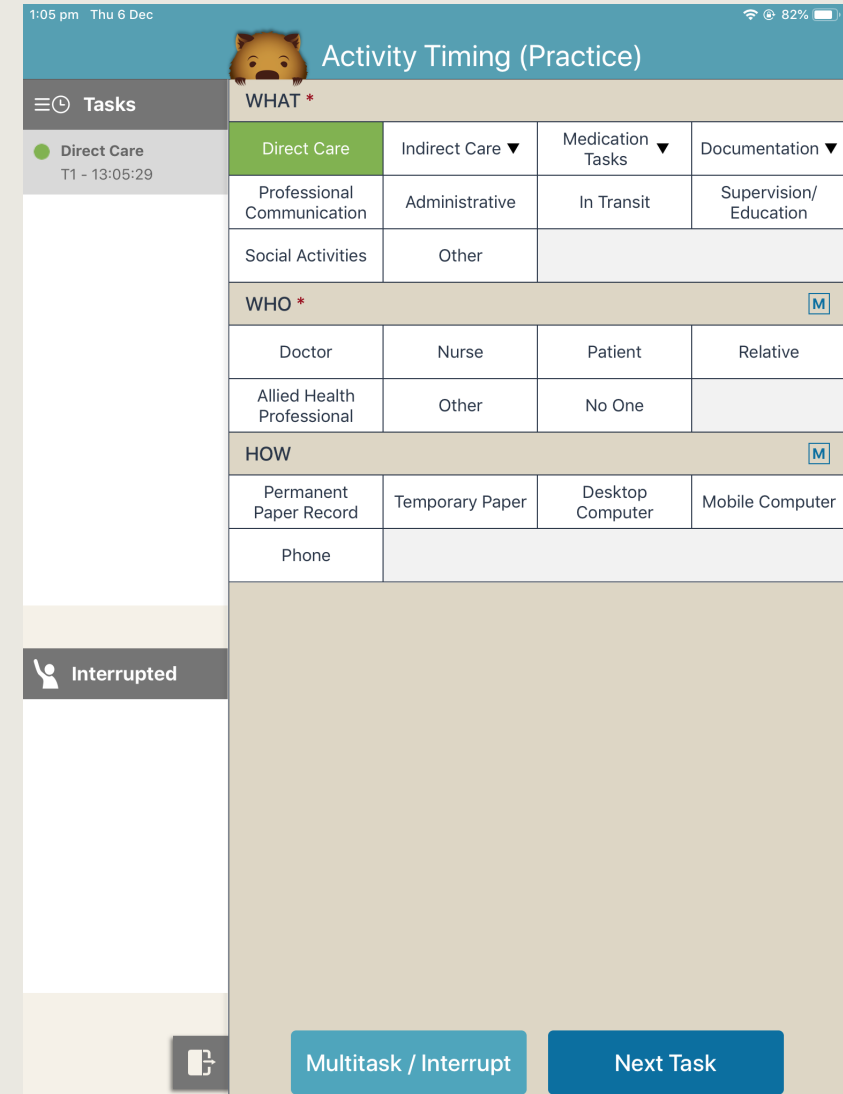


The screenshot displays the WOMBAT 2.0 app interface on an Android tablet. The title bar at the top reads "WOMBAT - Activity Timing (DUMMY)". On the left, a vertical sidebar shows a status indicator "Active" with a green bar and a timestamp "11:11:54". The main content area is organized into sections: "What" (a 3x3 grid of activity types like "Chart rev", "Clin rev", "Hx taking"), "With" (a 3x3 grid of roles like "Patient", "Relative", "Doctor"), "Where" (a 1x3 grid of locations like "On ward", "Off ward", "Pharm dept"), and "How" (a 2x3 grid of methods like "Fax", "Fixed PC", "Phone"). Each button in these grids has a small green progress bar. At the bottom, there are two large buttons: "End Session" and "Next Task". The Android navigation bar is visible at the very bottom.

WOMBAT – 3.0

WOMBAT 3.0 redesigned in 2019 for use on iOS,
with improved user interface and usability.

WOMBAT 3.0 allows researchers to include a free
text field in their data collection templates,
increasing the capacity to examine and answer
different research questions.



1:05 pm Thu 6 Dec 82%

Activity Timing (Practice)

WHAT *

Direct Care	Indirect Care ▼	Medication Tasks ▼	Documentation ▼
Professional Communication	Administrative	In Transit	Supervision/ Education
Social Activities	Other		

WHO * M

Doctor	Nurse	Patient	Relative
Allied Health Professional	Other	No One	

HOW M

Permanent Paper Record	Temporary Paper	Desktop Computer	Mobile Computer
Phone			

Interrupted

📄 Multitask / Interrupt Next Task

How does WOMBAT work?



Continuous recording
and automatic time-
stamping



Customisable study templates
(flexible number of dimensions,
categories, subcategories; notes
field)



Record interruptions
and their nature



Off-line data collection

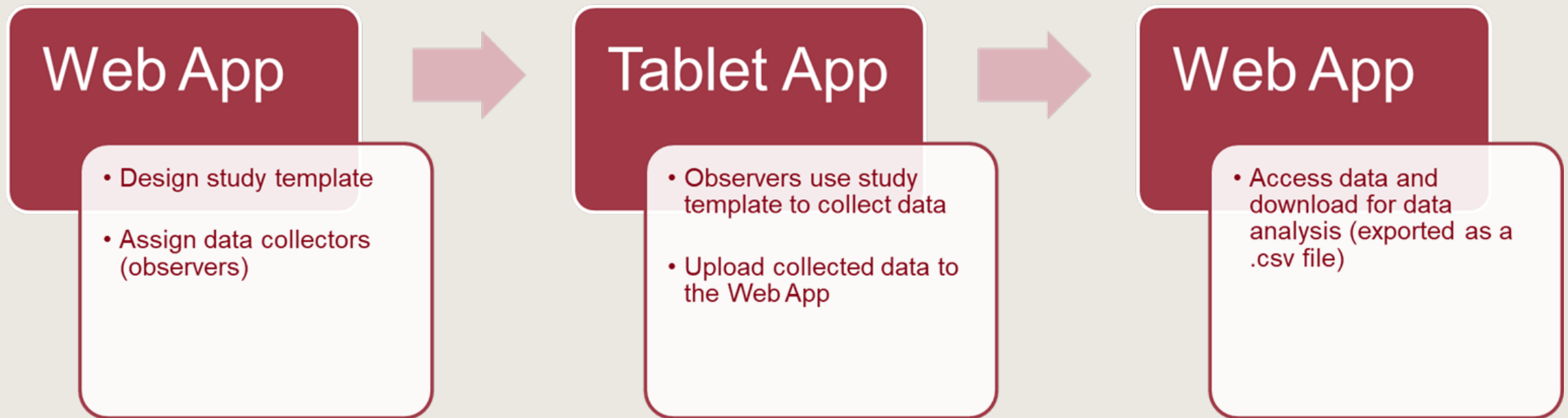


Record multitasking
instances and their
nature



Research in any discipline





WOMBAT Study Questions

- Proportion of time spent on particular tasks
- Proportion of time spent undertaking tasks in different locations
- Proportion of time spent with other health professionals, patients, or alone
- Proportion of tasks completed using specific resources/tools
- Frequency and average time taken for specific tasks
- Rate of interruptions to work
- Proportion of time spent multitasking



WOMBAT Studies on Clinical Workflows



MACQUARIE
University

AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION

Medication-related tasks

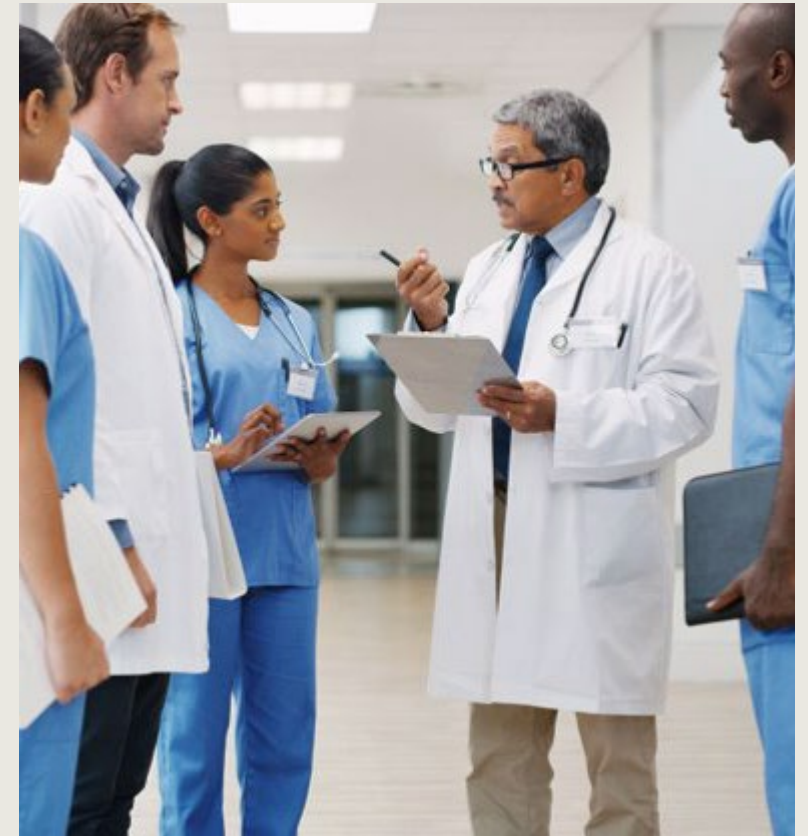
- Nurses' time on medication tasks and interruptions
- Impact of electronic medication management systems

Doctors and nurses' work patterns

- Communication and workflow in hospital wards
- ICU and surgical ward work patterns

Interruptions and multitasking

- ICU and surgical wards
- Emergency departments and prescribing errors



WOMBAT Expanding Across Roles/Settings



MACQUARIE
University

AUSTRALIAN INSTITUTE
OF HEALTH INNOVATION

Pharmacists

- Hospital and community pharmacy workflows

Other clinical roles

- Nuclear medicine technologists
- Renal dietitians
- Birth attendants' hand hygiene

Ambulatory and home care

- Nurses' medication management
- EHR use in ambulatory care

Junior doctors

- After-hours and weekend work patterns

WOMBAT Seminal Study

Aim: Examine patterns of work among primary care physicians

Sample: 57 physicians observed for 430 hours

Key Findings:

- Physicians spent 49.2% of time on EHR and desk work, 27% on direct patient care
- EHR tasks consumed 1.4 hours outside clinic daily
- For every hour physicians provide direct clinical face time to patients, nearly 2 additional hours is spent on EHR and desk work within the clinic day

Annals of Internal Medicine

ORIGINAL RESEARCH

Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 Specialties

Christine Sinsky, MD; Lacey Colligan, MD; Ling Li, PhD; Mirela Prgomet, PhD; Sam Reynolds, MBA; Lindsey Goeders, MBA; Johanna Westbrook, PhD; Michael Tutty, PhD; and George Blike, MD

Background: Little is known about how physician time is allocated in ambulatory care.

Objective: To describe how physician time is spent in ambulatory practice.

Design: Quantitative direct observational time and motion study (during office hours) and self-reported diary (after hours).

Setting: U.S. ambulatory care in 4 specialties in 4 states (Illinois, New Hampshire, Virginia, and Washington).

Participants: 57 U.S. physicians in family medicine, internal medicine, cardiology, and orthopedics who were observed for 430 hours, 21 of whom also completed after-hours diaries.

Measurements: Proportions of time spent on 4 activities (direct clinical face time, electronic health record [EHR] and desk work, administrative tasks, and other tasks) and self-reported after-hours work.

Results: During the office day, physicians spent 27.0% of their total time on direct clinical face time with patients and 49.2% of

their time on EHR and desk work. While in the examination room with patients, physicians spent 52.9% of the time on direct clinical face time and 37.0% on EHR and desk work. The 21 physicians who completed after-hours diaries reported 1 to 2 hours of after-hours work each night, devoted mostly to EHR tasks.

Limitations: Data were gathered in self-selected, high-performing practices and may not be generalizable to other settings. The descriptive study design did not support formal statistical comparisons by physician and practice characteristics.

Conclusion: For every hour physicians provide direct clinical face time to patients, nearly 2 additional hours is spent on EHR and desk work within the clinic day. Outside office hours, physicians spend another 1 to 2 hours of personal time each night doing additional computer and other clerical work.

Primary Funding Source: American Medical Association.

Ann Intern Med. 2016;165:753-760. doi:10.7326/M16-0961 www.annals.org
For author affiliations, see end of text.
This article was published at www.annals.org on 6 September 2016.

Ambulatory care in the United States has been subject to dramatic pressures in the past decade to cut costs, meet regulations, and transition to electronic health records (EHRs). Effects on ambulatory care are still unknown, and unintended consequences are gradually gaining recognition, including additional time spent documenting care (1) and performance metrics (2), impaired communication with patients (3), and increased career dissatisfaction (4) and burnout (5-7) among physicians.

In the context of rapid change, dissatisfaction among physicians with how their time and skills are used is widespread and growing. Fifty-four percent of U.S. physicians experience some sign of burnout (5), an increase from 46% (6) over a 3-year period, 2011 to 2014, ($P < 0.001$). Time spent in meaningful interactions with patients and the ability to provide high-quality care are powerful drivers of physician career sat-

isfaction and practice characteristics (including EHR use and documentation support services) for physicians in the era of EHRs and federal incentive and penalty programs. In other words, what is work like for physicians in the ambulatory trenches?

METHODS

Study Participants

The American Medical Association's (AMA) annual study of physician characteristics and distribution in the United States (compiled from the AMA Physician Masterfile) and discussions among the researchers informed the decision to study 2 types of primary care practices (family medicine and internal medicine), 1 medical specialty (cardiology), and 1 surgical specialty (orthopedics). These specialties and practice types had higher numbers of physicians than other specialties





The WOMBAT App is freely available on the App Store and includes a Lite Version, which allows users to explore how WOMBAT works, how data are collected using WOMBAT, what collected WOMBAT data looks like, and examples of measures for analysis.



Q&A



MACQUARIE
University
SYDNEY • AUSTRALIA

www.mq.edu.au/research/wombat



Dr Mirela Prgomet

mirela.prgomet@mq.edu.au

