A workshop on how to design and use:

Work Observation Method By Activity Timing

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Workshop objectives & outline

Part 1 (25mins)
- Background - why WOMBAT was developed and why it might be useful in your research
- Examples and results from previous studies which have applied WOMBAT

Part 2 (25 mins)
- Demonstrate the features, adapting the tool for different studies

Part 3 (35 mins)
- Practical session – recording data
- Conclusion & final questions (10 mins)
What is a WOMBAT?

- Short-legged, marsupial, native to Australia.
- Grow about 1m in length with short, stubby tails.
- Dig extensive burrows.
- Backwards pouch so that when digging, they do not gather soil in their pouches over young.
- Cubic faeces
Method and tool to undertake sophisticated time and motion studies to measure health professionals’ patterns of work and communication
Clinician’s patterns of work

- Limited evidence of how clinicians distribute their time.

- Time in direct care associated with better patient outcomes and fewer errors {Aiken, 2002; Needleman, 2002; Duffield, 2011}.

- Patient satisfaction also related to the amount of direct care received {Staniszewska, 1998}.

- Qualitative studies reveal clinicians’ satisfaction is associated with time spent in clinical work {Mechanic, 2003}.

- Clinicians dissatisfied with ‘excessive paperwork’ and ‘wasted time’ spent locating other professionals {Miller, 1997}, documents or equipment {Lambert, 2000}. 
Systems are promoted for their ability to improve work efficiency and safety

- Less time on administrative tasks
- More time for patient care
Research Evidence

- Qualitative accounts - both significantly hinders and assists work efficiency

- Concerns of time away from direct care; reduced communication between staff; new types of errors; new source of interruptions  {Collins, 2006; Beuscart-Zephir, 2005}

- Quantitative evidence is sparse

- Most studies on doctors’ work in ambulatory care and critical care.

- Limited studies of nurses’ work
Challenge of quantifying changes in patterns of work and communication

- Early work – work sampling shown to be unreliable {Ampt, 2007}

- Time and motion – more accurate, particularly using technology for data recording
  - Existing Tools - only allowed for sequential, uni-dimensional data collection about work
  - Did not account for key aspects of work including, multi-tasking, interruptions and the collaborative nature of much work
A web application server running the Apache Web Server and a Ruby on Rails application on a Linux Operating System.
Work Observation Method By Activity Timing -

What task?
With whom?
With what?
Where?
Interruptions
Moving from paper medication charts to electronic prescribing and administration
Aim: To measure changes in how nurses & doctors distributed their time across work tasks

- Changes in time spent on:
  - Medication tasks
  - Direct Care
  - Professional Communication
Controlled Pre and Post Study

4 Wards Pre Year 1
- Control
- Control
- Intervention
- Intervention

4 Wards Post Year 3
- Control
- Control
- eMMS
- eMMS
Direct Observations Nurses & Doctors

70 nurses observed for 276.9 hours
59 doctors observed for 356.3 hours
Results

Did nurses & doctors on the eMMS wards spend more or less time on direct care, medication tasks and professional communication compared to clinicians on the control wards?
### Nurses

**Comparison of time distribution control and eMMS Wards**

<table>
<thead>
<tr>
<th></th>
<th>Period</th>
<th>%</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Care</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>22.1</td>
<td>0.23</td>
</tr>
<tr>
<td>eMMS</td>
<td></td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td><strong>Medication</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>23.7</td>
<td>0.28</td>
</tr>
<tr>
<td>eMMS</td>
<td></td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td><strong>Prof Comm.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>20.1</td>
<td>0.57</td>
</tr>
<tr>
<td>eMMS</td>
<td></td>
<td>22.8</td>
<td></td>
</tr>
</tbody>
</table>

No Significant Differences
## Doctors

### Comparison of time distribution control and eMMS Wards

<table>
<thead>
<tr>
<th>Period</th>
<th>%</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Care</td>
<td>19.7</td>
<td>0.08</td>
</tr>
<tr>
<td>eMMS</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td>7.4</td>
<td>0.4</td>
</tr>
<tr>
<td>eMMS</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Prof Comm.</td>
<td>36.6</td>
<td>0.8</td>
</tr>
<tr>
<td>eMMS</td>
<td>37.6</td>
<td></td>
</tr>
</tbody>
</table>

No Significant Differences
Time Nurses Spent with Others
Baseline

- 33% of nurses time is spent with patients
- 50% spent with other nurses
- 5% with doctors
- 4% with Relatives
Changes Following eMMS

- Nurses on the eMMS wards spent less time with doctors \((p=0.0001)\).
- 4.2% less time than nurses on the control wards.
- Due to both fewer interactions (tasks per hour) and shorter interactions (mean task time).
Time Doctors Spent with Others
Baseline

- 18% of doctors time is spent with patients
- 63% spent with other doctors
- 10% with nurses
- 4% with relatives
Changes Following eMMS for Doctors

- Doctors on the eMMS wards spent more time with other doctors (p=0.003).
- 6% more time than doctors on the control wards.
- Doctors spent more time with patients (p=0.009)
- 6% more time than doctors on the control wards.
Did nurses’ work generally change between year 1 and year 3?
How has work changed over time?—not associated with eMMS

- Nurses now spending significantly more time on medication tasks (p=0.001)
  - 20.2% year 1 → 23.1% year 3

- Nurses now spending more time on direct care (p=0.003)
  - 20.2% year 1 → 24.2% year 3

- No change in time spent in prof. communication.
Impact of an electronic medication management system on hospital doctors’ and nurses’ work: a controlled pre–post, time and motion study

Johanna I Westbrook, Ling Li, Andrew Georgiou, Richard Paoloni, John Cullen

Available at JAMIA.BMJ.Com
Preprint ahead of publication
<table>
<thead>
<tr>
<th>Measures generated from WOMBAT datasets</th>
<th>Examples from published studies</th>
<th>Examples of research questions which can be addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of time spent on tasks</td>
<td>ICU nurses spent 39% in professional communication.</td>
<td>Do clinicians shift to spend more or less time in categories of work following an intervention?</td>
</tr>
<tr>
<td>Average or median length of time spent on individual tasks</td>
<td>Pharmacists on wards with CPOE spent on average 43.7 secs per task v 1:16 on wards without CPOE.</td>
<td>Do some tasks become more or less efficient? Also a measure of rapidity of task changing.</td>
</tr>
<tr>
<td>% of time spent on tasks in specific locations</td>
<td>75.1% of ward doctors’ work was spent on the ward.</td>
<td>Answers questions about what work is done where.</td>
</tr>
<tr>
<td>% of time spent with health professionals, patients or alone</td>
<td>83% of hospital pharmacists’ time on a ward with CPOE was spent alone compared to 73% for pharmacists on wards without CPOE.</td>
<td>Answers questions about how much collaborative work is undertaken, with whom and where.</td>
</tr>
</tbody>
</table>
Part 2
Designing a study

- What is the focus of the study?
- What questions are you trying to answer?
- Example: How do junior doctors spend their time on night-shifts?
  - What do they do?
  - With whom do they do it?
  - What tools/devices do they use?
  - Extra interest: How much time do they spend transcribing day-time medication orders?
Create a study template
Dimensions, categories and sub-categories

Dimensions: the highest level of grouping, for example “Who”, “What” and “Where”

Categories: options within a dimension, for example “Doctor”, “Nurse” and “Patient”

Subcategories: drop down options within a category
Dimensions
Categories
Number of dimensions & categories?

- Study must contain at least 1 dimension & 1 category.
- WOMBAT designed for templates that include up to 4 dimensions with 10 rows of categories.
- More dimensions and categories can be included but this will require the user to scroll down when collecting data.
Step 1: Decide on dimensions

Order of dimensions is important

The 1st dimension should be the focus of the study

In our night time study, **What** task the doctors are performing is the most important dimension
What dimensions are mandatory?

- Does the dimension have to be selected for every observation?
- For example, if the doctor is not using a tool, our **With what** does not need to be selected.
What dimensions are multi-selectable?

- Can multiple categories under 1 dimension be selected at the same time?

- For example, you can select 2 categories from our **With** dimension if a doctor is communicating with 2 people.
Step 2: Decide on categories for each dimension

- If selection is mandatory, ensure your categories cover all possible observations (or include an ‘other’ category)
Step 3: Add any subcategories

These are optional but can be useful if more detail about a task is needed.

- For example, in our night time study, we wanted to know how much time doctors spent transcribing day-time medication orders.
- We included 2 subcategories under the Medication category:
  1. Transcribe
  2. Other medication tasks
Definitions are very important!

Your definitions of each category and subcategory need to be:

- Clear
- Detailed
- Mutually exclusive (no overlap!)

Good to include inclusion and exclusion criteria to avoid uncertainty and ambiguity in data collection.
### Example definition

<table>
<thead>
<tr>
<th>Task</th>
<th>Includes</th>
<th>Excludes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional communication - any communication with other health professionals</td>
<td>Communication with health professionals either in person, over the phone, via page, SMS or email</td>
<td>Communication related to medications</td>
</tr>
<tr>
<td>Meetings</td>
<td>Communication with a patient or relative</td>
<td></td>
</tr>
<tr>
<td>Requests for medical consultation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussions about patient care</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Two parts to WOMBAT

- **Tablet**
  - Includes WOMBAT app for data collection

- **Web application**
  - Register new users, modify permissions and access for existing users
  - Design, modify, copy and export study templates
  - Upload participants attributes
  - Download data for analysis
Step 4: Create your study template on the web app
Step 4a: Create a new study

Create New Study

Name: Doctors Work Measurement V1
Session duration (minutes): 120
End session alert? Yes

Next  Cancel
Step 4b: Add your dimensions

Limitations

You can have as many dimensions, categories and subcategories as you like. However once you reach a certain number, the user will have to scroll on the tablet to view all the options.

Below are the approximate limits:

- With 4 dimensions, you can fit approximately 30 categories on screen at one time (spread across the 4 dimensions)
- Category names are truncated at 12 characters on the tablet
- You can fit approximately 8 subcategories on the screen at one time
Step 4c: Add your categories

Please note the categories and subcategories in this dimension will be used as labels in the task list on your tablet.

<table>
<thead>
<tr>
<th>Category</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Care</td>
<td>Delete</td>
</tr>
<tr>
<td>Indirect Care</td>
<td>Delete</td>
</tr>
<tr>
<td>Medication</td>
<td>Delete</td>
</tr>
<tr>
<td>Documentation</td>
<td>Delete</td>
</tr>
<tr>
<td>Professional Communication</td>
<td>Delete</td>
</tr>
<tr>
<td>Administration</td>
<td>Delete</td>
</tr>
<tr>
<td>In transit</td>
<td>Delete</td>
</tr>
<tr>
<td>Supervision/Education</td>
<td>Delete</td>
</tr>
<tr>
<td>Social</td>
<td>Delete</td>
</tr>
</tbody>
</table>

Add more

Limitation:

You can have a maximum of 20 categories per dimension (maximum number of tasks on the screen is 20). Categories must be unique across the 4 dimensions.

- Category names are truncated at 12 characters on the tablet.
- You can fit approximately 8 subcategories on the screen at one time.
### Step 4c: Add any subcategories

*Please note the categories and subcategories in this dimension will be used as labels in the task list on the tablet.*

**Single/Multiple Selection(s): Single**  
**Mandatory/Optional:** Mandatory  
**Default Category:** None  

<table>
<thead>
<tr>
<th>Category</th>
<th>Add Subcategories</th>
<th>Make default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Care</td>
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<td></td>
</tr>
<tr>
<td>In transit</td>
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<td></td>
</tr>
</tbody>
</table>

**Edit Categories**
Step 4d: Finish designing study template

The subcategories were successfully updated.

Configuration for the Doctors Work Measurement V1 study

Session duration: 2 hours

Add Dimension

Finished

What Edit Delete Please note the categories and subcategories in this dimension will be used as labels in the task list on the tablet.
Step 4e: Mark template as ‘Active’

Manage Study Doctors Work Measurement V1

Mark the status of your template, then click 'Save'

- Exemplar
  - Active
- Archived
Part 3
Downloading a study template

Click on the WOMBAT
Starting a session

Timer starts when you press “start”
Scenario

- A doctor is on the ward typing a discharge summary (d/s) on a desktop computer.
- She finishes the d/s then picks up the phone and rings a specialist to discuss a patient.
- After she hangs up the phone, she uses the desktop computer to prescribe a medication.
- A nurse interrupts the doctor to ask about a patient. After answering the nurse's question, the doctor resumes writing the prescription.
- The phone rings and the doctor answers the phone but continues to write the prescription while talking to her friend about the weekend.
A doctor is on the ward typing a discharge summary on a desktop computer.

**What** Documentation – discharge summary
A doctor is on the ward typing a discharge summary on a desktop computer.

**What** Documentation – discharge summary

**Who** No one

**How** Desk-PC

**Where** On ward
Recording the next task

She finishes the d/c summary then picks up the phone and rings a specialist to discuss a patient.
The “Documentation” task has moved to the completed task section in the task list.

The timer stopped the previous task and started timing this task when we pressed “Next Task”.

We are now ready to record the next task.
Next task

She picks up the phone and rings a specialist to discuss a patient.

**What** Professional communication

**Who** Doctor

**How** Phone

**Where** On ward
After she hangs up the phone, she uses the desktop computer to prescribe a medication. Click “Next Task”

**What** Medication - prescribe

**Who** No one

**How** Desk-PC

**Where** On ward
Recording interruptions

She uses the desktop computer to prescribe a medication. A nurse interrupts the doctor to ask about a patient.

Click “Next Task”
Click “Interruption”
A nurse interrupts the doctor to ask about a patient.

**What** Professional communication

**Who** Nurse

**How**

**Where** On ward
After answering the nurse's question, the doctor resumes writing the prescription. Make sure “Professional communication” is highlighted.

Click “End Task”
Recording multitask

The doctor resumes writing the prescription.  
No need to enter this – still active  
The phone rings and the doctor answers the phone but continues to write the prescription.  
Click “Next Task”  
Click “Multitask”
Continues to write the prescription while talking to her friend about the weekend.

**What** Social

**Who** Other

**How** Phone

**Where** On ward
Ending a multitask

Make sure “Social” is highlighted
Click “End Task”
Questions
Example of data generated

<table>
<thead>
<tr>
<th>session date</th>
<th>observer</th>
<th>session</th>
<th>participant</th>
<th>session start</th>
<th>session end</th>
<th>What</th>
<th>start time</th>
<th>end time</th>
<th>elapsed time</th>
</tr>
</thead>
</table>
Importance of standardisation and international comparative studies

- Develop the evidence base about how ICT impacts upon work and communication patterns and workflow

- Standardised research methods and tools allows advances by permitting comparisons across studies. {Zheng, 2011 #3798}

- Early comparison studies using the WOMBAT in Australia and Canada have shown this is possible and increases our ability to draw robust conclusions. {Ballerman, 2011}
For Further Information WOMBAT

- Cost for Researchers:
  - $A2500 (1720€/12840DKK/1480£) 3 year licence
  - $A1500 for PhD Students (1032€)

- Detailed Manual
- Software downloaded on your server or there is a hosting option


wombat@unsw.edu.au
Questions & Comments