

A4. Steps of the Time-driven activity-based costing method

1. Process mapping through discussion with local teams for each respiratory condition (eg, salbutamol in acute asthma) and resources involved (eg, respiratory therapist);
2. Validation of process maps and durations by on-field research assistants prospectively observing patients and measuring process duration using a time-motion software (UMT Plus (Laubrass))–**Figure 1**;
3. Estimate of cost per time unit of cost elements (\$/min):
 - i. Human resources (eg, nurses, physicians) or equipments (eg, X-ray machine)–**Figure 2**;
 - ii. Consumable supplies (eg, gloves, needles, paper)–**Figure 3**;
 - iii. Overheads (eg, building maintenance)–**Figure 4**;
4. Estimate of the cost of traceable supplies (eg, medication, laboratory testing);
5. Calculation of the average cost of each health care process–**Figure 5**.

Figure 1. UMT Plus (Laubrass)–configuration of time-motion software

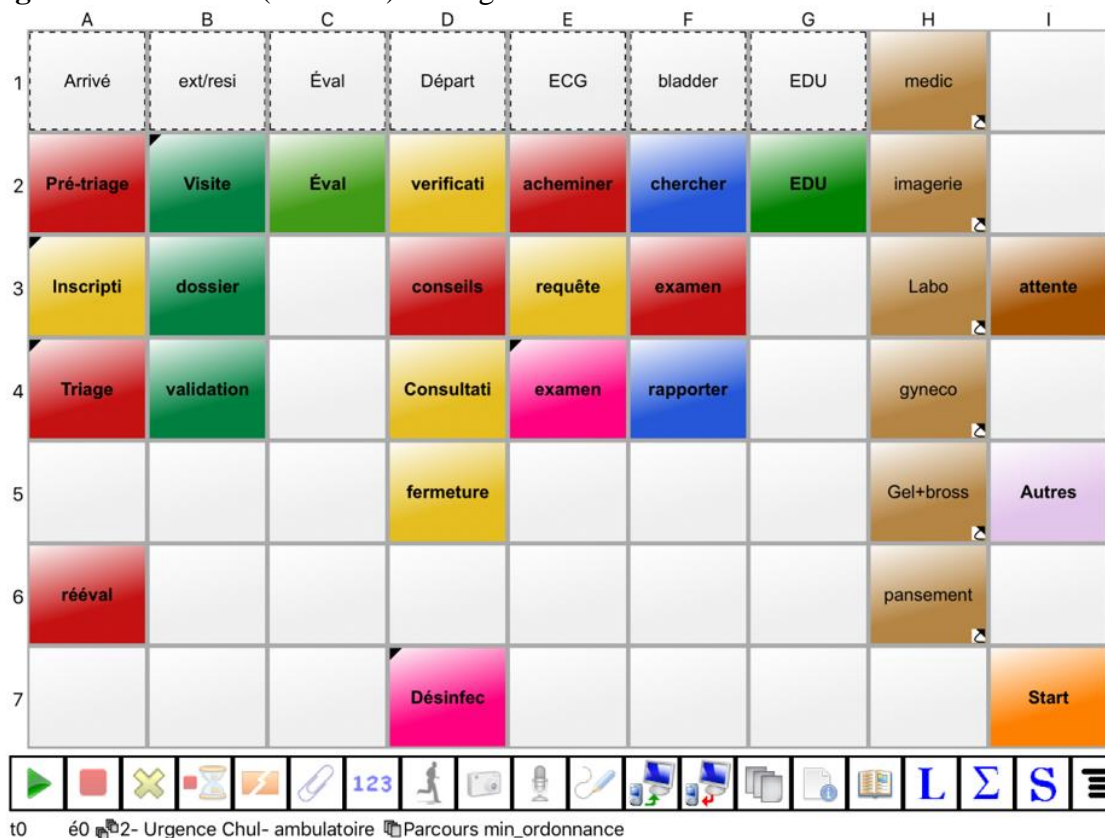


Figure 2. Unit cost (Can \$) calculation for nurses in 2015-2016 at the CHUL ED^{a-d}

$$\frac{\text{Total annual expenses for ED nurses}}{\text{Total annual minutes of availability to patient care (ED nurses)}} = \frac{\$8,414,750.92}{8,226,060 \text{ min}} = 1.02 \text{ \$/min}$$

- ^aExpenses include salaries, training stipends, benefits.
^bMinutes exclude vacations, meetings and breaks.
^cA currency exchange rate of US \$1=Can \$1.31 is applicable.
^dCHUL: Centre Hospitalier de l'Université Laval; ED: emergency department.

Figure 4. Unit cost (Can \$) calculation for overheads in 2015-2016 at the CHUL ED^{a-d}

$$\frac{\text{Annual overheads allocated to the ED}}{\text{Total annual minutes of availability to patient care (All ED professionals)}} = \frac{\$3,392,033.45}{15,162,187 \text{ min}} = 0.22 \text{ \$/min}$$

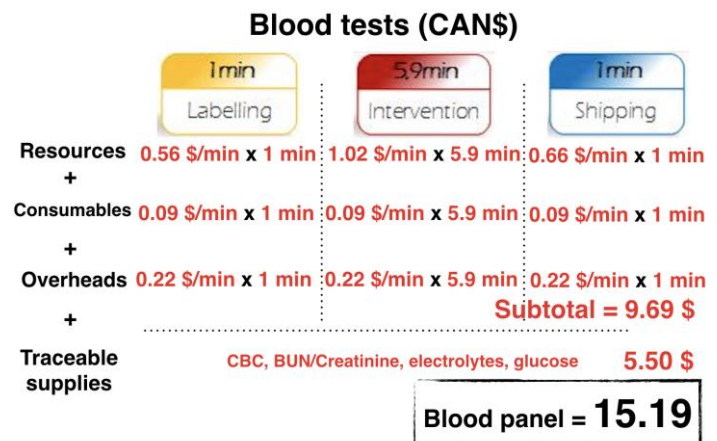
- ^aOverheads include institutional fixed and variable costs (e.g. human resources) imputed to the ED.
^bMinutes exclude vacations, meetings and breaks.
^cA currency exchange rate of US \$1=Can \$1.31 is applicable.
^dCHUL: Centre Hospitalier de l'Université Laval; ED: emergency department.

Figure 3. Unit cost (Can \$) calculation for consumable supplies used in 2015-2016 at the CHUL ED^{a-d}

$$\frac{\text{Total annual cost of consumables}}{\text{Total annual minutes of availability to patient care (All ED professionals)}} = \frac{\$1,377,938.70}{15,162,187 \text{ min}} = 0.09 \text{ \$/min}$$

- ^aConsumables include all disposal supplies (e.g. needles).
^bMinutes exclude vacations, meetings and breaks.
^cA currency exchange rate of US \$1=Can \$1.31 is applicable.
^dCHUL: Centre Hospitalier de l'Université Laval; ED: emergency department.

Figure 5. Example of cost calculation for a care process (blood tests) using time-driven activity-based costing^a



^aA currency exchange rate of US \$1=Can \$1.31 is applicable.