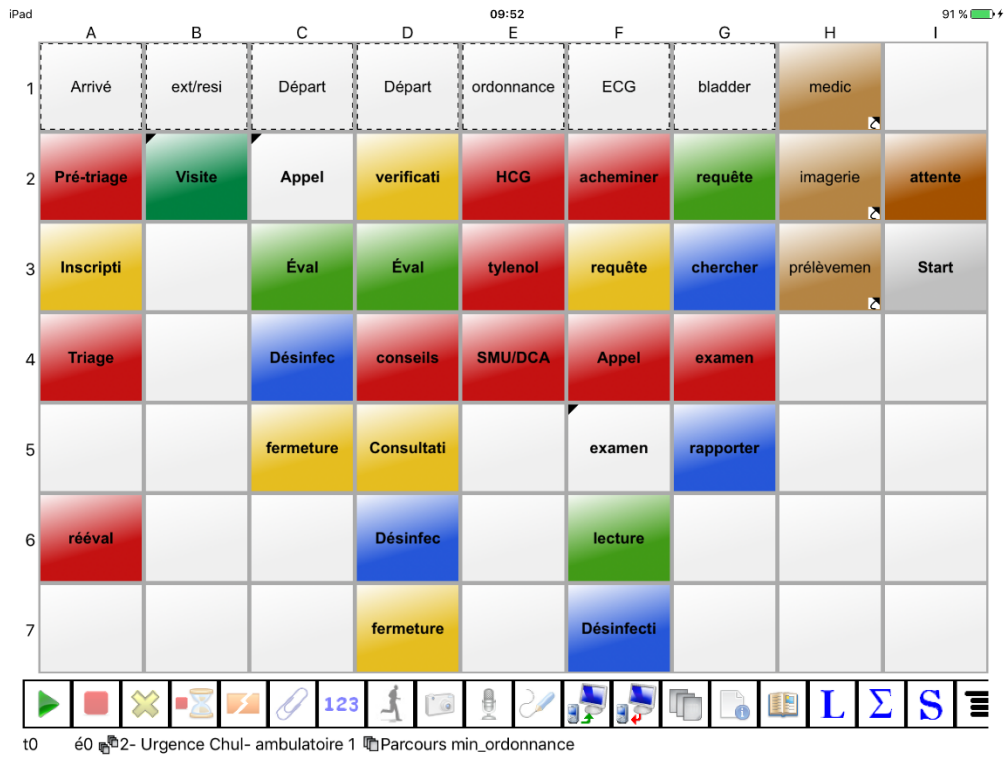


Web-Appendix A1. Panel of experts

Number of participants	Multidisciplinary team
3	Nurses
2	Emergency physicians
1	Head nurse
1	Respiratory therapist
1	Imaging technician
1	Clerk
1	Nursing assistant
1	Lean management consultant
1	External medicine student
1	Financial management officer

Web-Appendix A2. Screen capture of time-motion software Laubress UmtPlus



Web-Appendix 3.

Calculation of the unit cost (\$Can) of nurses in the CHUL emergency department for 2015–2016

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

*Expenses include salaries, training stipends and benefits.

**Minutes exclude vacations, meetings and breaks.

***As care providers can be assigned on a given day to any area of the ED, the unit costs calculated using this formula apply to care procedures performed throughout the ED (resuscitation, stretcher or ambulatory care areas).

Web-Appendix 4.

Calculation of the cost per minute (\$Can) of consumable supplies used in the CHUL emergency department during fiscal year 2015–2016

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

*Consumables include all disposal supplies (e.g. needles, masks, swabs).

** Minutes exclude vacations, meetings and breaks.

*** The cost per minute of consumables is calculated independently of the area of the ED where they were used because these consumables are not traceable.

Web-Appendix 5.

Calculation of overhead cost per minute (\$Can) in the CHUL emergency department during fiscal year 2015–2016

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

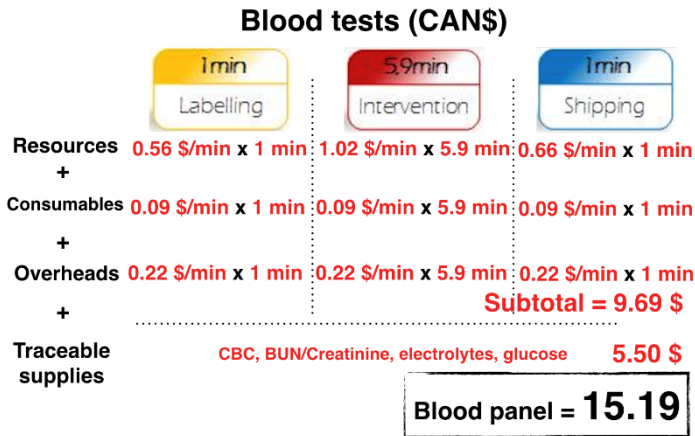
*Overhead expenses include institutional fixed and variable costs (e.g. human resources) imputed to the ED.

** Minutes exclude vacations, meetings and breaks.

***The cost per minute of overhead can be applied to the cost of patient care in any ED area.

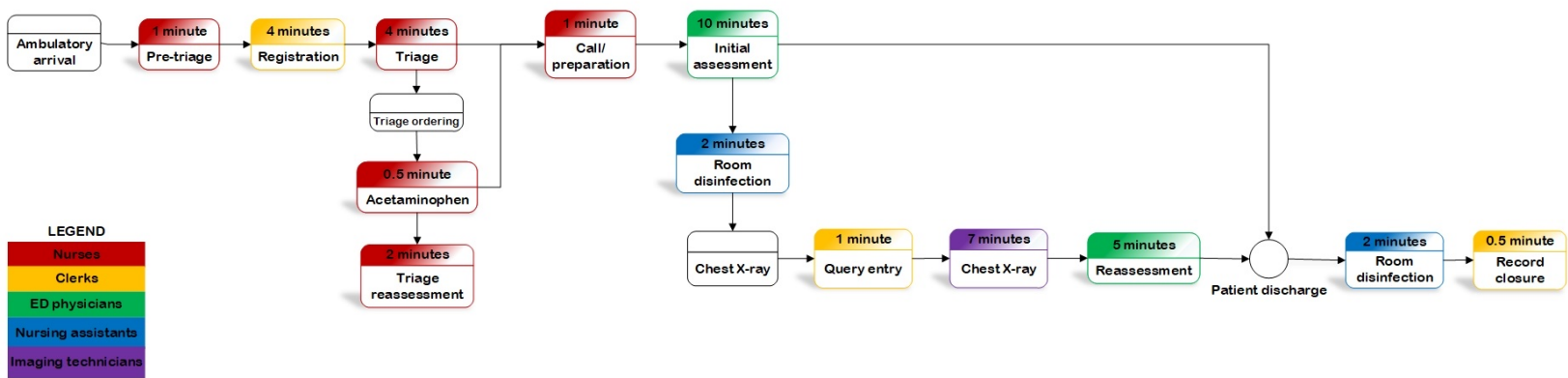
Web-Appendix 6.

Example of a care procedure cost (blood tests) calculated using time-driven activity-based costing (\$Can)



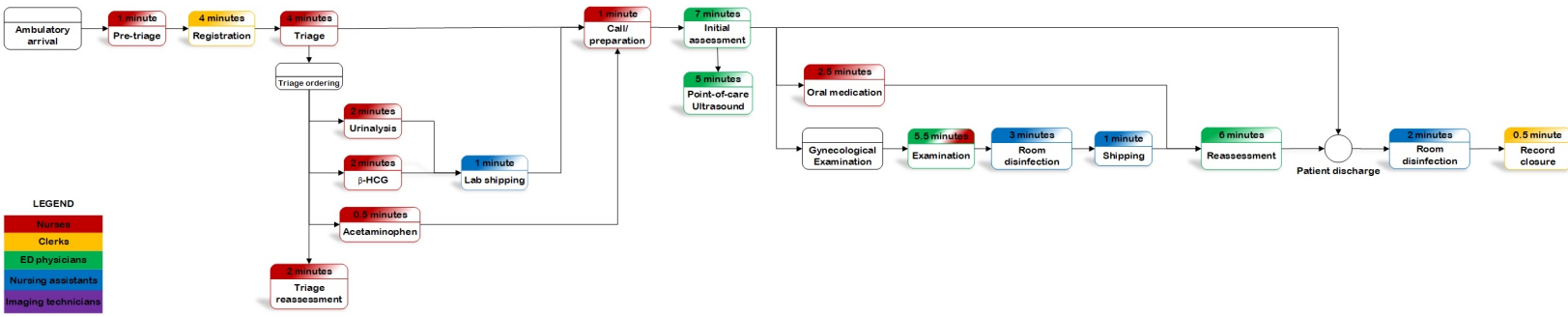
Web-Appendix 7. Process maps

Upper respiratory tract infection



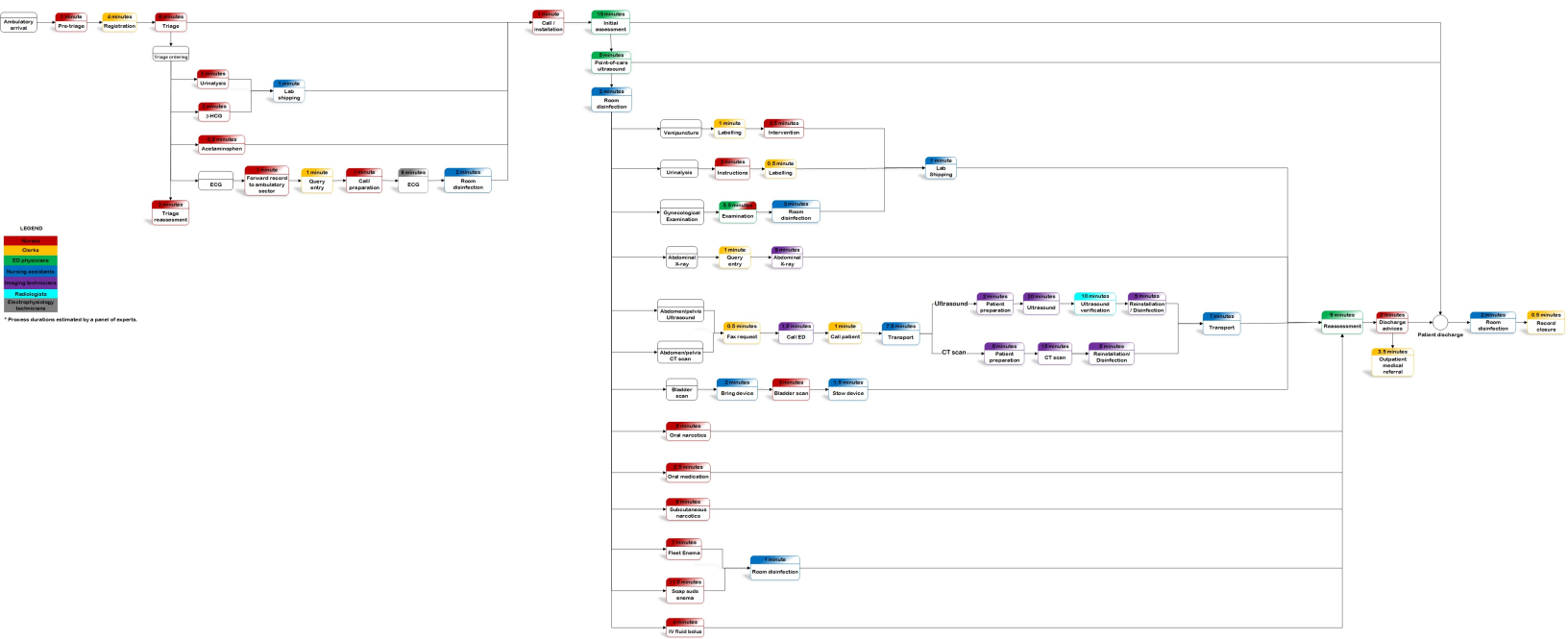
*Process durations estimated by a panel of experts.

Urinary tract infection



*Process durations estimated by a panel of experts.

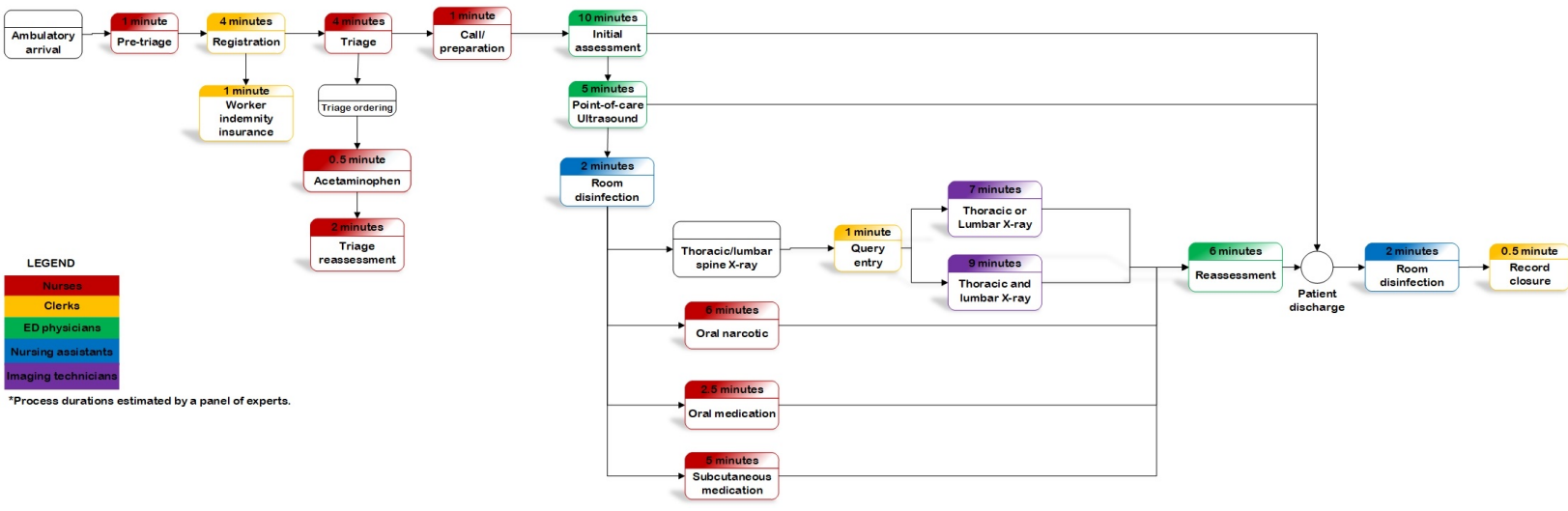
Unspecified abdominal pain



LEGEND
 Ambulatory arrival
 Call notification
 Initial assessment
 Patient care / Ultrasound
 Transport
 Patient discharge
 Room distribution
 Lab shipping
 ECG
 Forward tracing to ambulatory center
 Query entry
 Call preparation
 ECG
 Room distribution
 Transport
 Reassessment
 Discharge advice
 Patient discharge
 Room distribution
 Record closure

*Success scenarios estimated by a panel of experts.

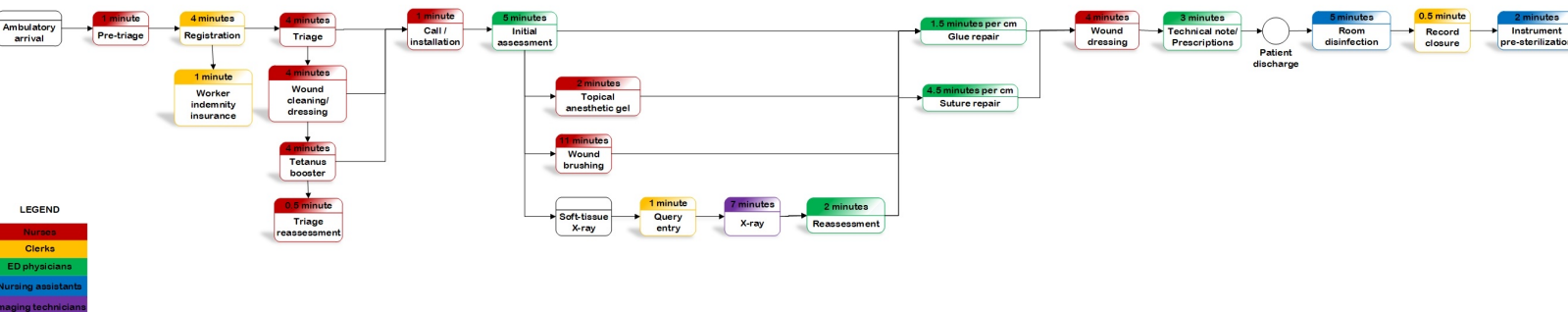
Low back pain



- LEGEND**
- Nurses
 - Clerks
 - ED physicians
 - Nursing assistants
 - Imaging technicians

*Process durations estimated by a panel of experts.

Superficial limb lacerations



*Process durations estimated by a panel of experts.

Web-appendix A8.

Summary of expenditures (\$CAN) on consumables at the CHUL, 2015-2016

General management (CHU de Québec-Université Laval)	Department (CHUL)	Resources involved	\$ (department)
General Management Emergencies	Emergency	Nurses, clerk, nursing assistants	1,377,938
Medical direction of hospital services	Medical Imaging	Imaging technicians	1,766,128
Multidisciplinary services direction	Respiratory Therapy	Respiratory therapist	5,464

Summary of overhead expenses (\$CAN) at the CHUL, 2015-2016

Category	\$ (hospital)	Allocation rule*	\$ (ED)†
General administration	8,242,491	Proportion of the ED budget to the hospital budget	112,259
Financial administration	8,342,295		113,618
Staff administration service	3,923,829		53,441
Technical services administration	2,189,678		29,822
IT department	14,082,100		191,791
Human resources management	10,134,119		157,190
Supplies and services	4,256,013		83,000
Telecommunication	3,686,659		70,979
Transportation to home or long-term facility for patients 65 years and older	719,367	Attributed entirely to the ED	719,367
Archives	–	\$8.91 per ED visit (75,929 visits in 2015-2016)	676,527
Food services	–	\$5.67 per meal (44,642 meals)	252,100
Laundry	1,316,997	Proportion of ED laundry trolleys per day to the hospital laundry trolleys per day	263,399
Hygiene and sanitation - operational tasks	4,415,187	Proportion of ED surface area to the hospital surface area (m ²)	163,008
Hygiene and sanitation - functional tasks	331,106		12,224
Operation of the installations	4,730,723		103,864
Biomedical waste management	290,804	Proportion of ED biomedical waste mass to the hospital biomedical waste mass	11,632
Security	1,376,246	Proportion of ED volumetric space to the hospital volumetric space (m ³)	38,047
Maintenance (building, equipment and furniture)	6,832,644		168,835
Direction of social services	172,929	Attributed entirely to the ED	172,929
Total	75,971,814		3,392,033

*Unless otherwise indicated, ED overhead cost = “hospital overhead cost” x “fraction allocated to the ED”

†Overhead is allocated to the care of the whole population of ambulatory patients with acute conditions since all are treated in the same facility area by the same care providers. Using time-driven activity-based costing, overhead costs are then allocated to the care of each ambulatory patient based on the estimated time of contact between the patient and care resources.