

Prioritizing performance measurement for emergency department care: consensus on evidence-based quality of care indicators

Appendix A. Membership of steering committee and expert panel

Steering committee	Expert panel
Howard Abrams <i>Director, General Internal Medicine, University Health Network, Toronto, ON</i>	Robert Abernethy <i>Associate Chief Medical Officer, Emergency and Acute Care Access, Calgary Health Region, Calgary, AB</i>
Marc Afilalo <i>Chief, Emergency Department, Jewish General Hospital, Montreal, QC</i>	Francis Bowen <i>Department Head and Medical Director of Emergency Medicine, Pasqua Hospital, Regina, SK</i>
Shahin Ansari <i>Senior Analyst, Performance Measurement, University Health Network, Toronto, ON</i>	Candice Bryden <i>Director, Quality Services, Saskatoon Health Region</i>
Francois Belanger <i>Pediatric Emergency Physician, Alberta Children's Hospital, Calgary, AB</i>	Michael J. Bullard <i>Professor of Emergency Medicine, University of Alberta, Edmonton, AB</i>
Debra Carew <i>Director of Operations, Trauma, Emergency and Critical Care Program, Sunnybrook Health Sciences Centre, Toronto, ON</i>	Ben Chan <i>Chief Executive Officer, Ontario Health Quality Council</i>
Tim Cooke <i>Management and Analysis Lead, Health Quality Council of Alberta</i>	Debbie Cotton <i>Education Coordinator, Guysborough Antigonish Strait Health Authority, NB</i>
Christopher Dean <i>Research and Product Development, Accreditation Canada</i>	Cathy Davis <i>Interim Director, Acute and Ambulatory Information Services, Canadian Institute for Health Information</i>
Jonathan F. Dreyer <i>Emergency Physician, Victoria Hospital and University Hospital, London, ON</i>	Paul Ellis <i>Assistant Medical Director, Emergency Department, University Health Network, Toronto, ON</i>
Joseph Gebran <i>Director, Canadian Patient Safety Institute</i>	Debbie Gibson <i>Health System Information Management and Investment Division, Ontario Ministry of Health and Long-Term Care</i>
Michael Harvey <i>Senior Manager, Strategic Directions Division, Alberta Health and Wellness</i>	Eric Grafstein <i>Chair, Regional Emergency Services Council, Providence Health Care-Vancouver Coastal Health, BC</i>
Brian R. Holroyd <i>Chair, Department of Emergency Medicine, University of Alberta</i>	Jocelyn Gravel <i>Department of Pediatrics, Hopital Sainte-Justine, Université de Montréal</i>
Grant Innes <i>Regional Clinical Department Head, Emergency Medicine, Calgary Health Region, Calgary, AB</i>	Dante Morra <i>Medical Director, Centre for Innovation in Complex Care, University Health Network, Toronto, ON</i>
Leighanne MacKenzie <i>Director, Emergency Services and Trauma Care, Vancouver Island Health Authority, BC</i>	Sharon Ramagnano <i>Advanced Practice Nurse Emergency/Trauma, Sunnybrook Health Sciences Centre, Toronto, ON</i>
Morag Mochan <i>Project Manager, ED Decongestion, British Columbia Ministry of Health</i>	Tom Rich <i>Physician Lead, Clinical Informatics, Emergency and Urgent Care, Calgary Health Region, Calgary, AB</i>

Table . Continued

Steering committee	Expert panel
Joe Nemeth <i>Chief of Emergency Medicine, Montreal General Hospital, Montreal, QC</i>	Kaveh G. Shojania <i>Canada Research Chair in Patient Safety and Quality Improvement, Sunnybrook Health Sciences Centre, Toronto, ON</i>
Wesley B. Palatnick <i>Medical Director, Adult Emergency Department, Health Sciences Centre, Winnipeg, MB</i>	Patti Simonar <i>Director, Emergency and Critical Care Services, Saskatoon Health Region, Saskatoon, SK</i>
Glen Perchie <i>Executive Director of Emergency Medical Services, Regina Health, Regina, SK</i>	Douglas Sinclair <i>Associate Dean for Continuing Medical Education, Faculty of Medicine, Dalhousie University, Halifax, NS</i>
Tom Rich <i>Physician Lead, Clinical Informatics, Emergency and Urgent Care, Calgary Health Region, Calgary, AB</i>	Jo-Ann Talbot <i>Emergency Physician, St-John Regional Hospital, NB</i>
John Ross <i>Chief, Emergency Department, QEII Health Sciences Centre and Capital Health Authority, Halifax, NS</i>	Bernard Unger <i>Associate Director, Emergency Department, Jewish General Hospital, Montreal, QC</i>
Antonia S. Stang <i>Assistant Professor, Department of Pediatrics, Division of Emergency Medicine, University of Calgary, Calgary, AB</i>	Alain Vadeboncoeur <i>Chief of Emergency Department, Montreal Heart Institute, Montreal, QC</i>
James Stempien <i>Department Head, Emergency Medicine, Saskatoon Health Region, Saskatoon, SK</i>	
Gary F. Teare <i>Director of Quality Measurement and Analysis, Saskatchewan Health Quality Council</i>	
Patricia Walsh <i>National Emergency Nurses Affiliation, NF</i>	

Appendix B—Candidate Indicators: Round 1 Expert Panel Survey Results

Table 1 Candidate Indicators following Round 1 Expert Panel survey, by operational/clinical category and indicator status (retained, discarded, borderline)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*
Patient Satisfaction	Retained	
	<ul style="list-style-type: none"> No indicators were retained. 	
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients who stated that they would recommend this ED to friends or family. 	(1)
	<ul style="list-style-type: none"> Overall patient rating of emotional support. 	(1)
	<ul style="list-style-type: none"> Overall patient rating of waiting time to see a physician. 	(1)
	<ul style="list-style-type: none"> Overall patient satisfaction with care received. 	(1)
	Borderline	
	<ul style="list-style-type: none"> Overall patient assessment of how well information was communicated to them or their family during their ED stay. 	(1)
	<ul style="list-style-type: none"> Percentage of patients prescribed a new medication who received instructions on how to take it. 	(1)
	<ul style="list-style-type: none"> Percentage of patients prescribed a new medication who were warned about side effects. 	(1)
	<ul style="list-style-type: none"> Overall rate of patient complaints to the emergency department (per 1,000 visits). 	(1)
Patient Safety	Retained	
	<ul style="list-style-type: none"> Percentage of central lines inserted in the ED which developed catheter-related blood stream infections. 	(2)
	<ul style="list-style-type: none"> Percentage of ectopic pregnancy patients with a missed diagnosis. 	(3)
	<ul style="list-style-type: none"> Percentage of intubated patients for whom end-tidal carbon dioxide was monitored. 	(4)
	<ul style="list-style-type: none"> Percentage of patients with headache discharged home from the ED who were admitted to hospital with a subarachnoid hemorrhage in the subsequent 14 days. 	(5)
	<ul style="list-style-type: none"> Percentage of missed diagnosis of acute myocardial infarction in the ED. 	(6)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator ^a
Patient Safety (continued)	Borderline	
	<ul style="list-style-type: none"> Percentage of endotracheal intubation attempts which are successful. 	(7; 8)
	<ul style="list-style-type: none"> Percentage of patients with appendicitis with a missed diagnosis. 	(3)
	<ul style="list-style-type: none"> Percentage of missed diagnostic imaging abnormalities resulting in the patient being recalled to the ED or treatment changed. 	(4)
ED Operations	Retained	
	<ul style="list-style-type: none"> Percentage of ED stretcher hours/day occupied by in-patients. 	(9)
	<ul style="list-style-type: none"> Percentage of time the ED is at or above stated capacity. 	(9)
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients who left before treatment complete (LBTC). 	(10)
	<ul style="list-style-type: none"> Percentage of Canadian Emergency Department Triage and Acuity Scale (CTAS) level 4 and 5 patients who have ED length of stay less than four hours. 	(11-14)
	<ul style="list-style-type: none"> Time from arrival in ED to triage. 	(12)
	<ul style="list-style-type: none"> Percentage of patients with pain assessed at triage. 	(15)
	<ul style="list-style-type: none"> Percentage of deaths in the ED in which the GP was notified. 	(4)
	<ul style="list-style-type: none"> Percentage of ED visits for conditions that could be treated in alternative primary care settings. 	(16)
	<ul style="list-style-type: none"> Percentage of ED patients admitted to the hospital—overall and by CTAS. 	(3; 10; 17-19)
	<ul style="list-style-type: none"> ED mortality rate—overall and within 48 hours of ED visit). 	(20-22)
	<ul style="list-style-type: none"> Percentage of patients seen in a fast-track area. 	(23)
	<ul style="list-style-type: none"> Percentage of patients whose regular doctor was informed and updated about the plan for follow-up after the hospitalization. 	(24)
	<ul style="list-style-type: none"> Percentage of ED patients where a GP follow-up letter was sent within five working days. 	(24)
<ul style="list-style-type: none"> Percentage of patients who left against medical advice. 	(25)	

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*
ED Operations (continued)	Borderline	
	<ul style="list-style-type: none"> Time from decision to admit to departure to floor, for admitted patients. 	(4;16)
	<ul style="list-style-type: none"> Percentage of CTAS level 2 and 3 patients with initial placement to waiting room. 	(16)
	<ul style="list-style-type: none"> Percentage of patients who left the ED without being seen. 	(3;10;17-19)
	<ul style="list-style-type: none"> ED length of stay (LOS): Time from first documented contact in the ED to the time of physical departure from the ED (overall and by Canadian Emergency Department Triage and Acuity Scale (CTAS)). 	(3; 10; 17-19)
	<ul style="list-style-type: none"> Time from physician assessment to discharge. 	(26-29)
	<ul style="list-style-type: none"> Time from triage to full nursing assessment. 	(29)
	<ul style="list-style-type: none"> Time from placing an order for a radiographic test until the results are returned. 	(25)
	<ul style="list-style-type: none"> Time from placing an order for laboratory testing until the results are returned. 	(22;25)
	<ul style="list-style-type: none"> Time from ED physician consult request to decision to admit (if admitted) or to physical departure (if discharged). 	(25;29)
	<ul style="list-style-type: none"> Ambulance Offload Time (AOT)—Time from patient/ambulance arrival to transfer of care to ED staff. 	(22; 25; 30)
	<ul style="list-style-type: none"> Percentage of CTAS level 1, 2 and 3 patients who have ED length of stay less than six hours. 	(11-14)
	<ul style="list-style-type: none"> Percentage of ED patients seen by a physician within target CTAS wait time. 	(11-14)
	<ul style="list-style-type: none"> ED (LOS) for critically ill patients. 	(11-14)
	<ul style="list-style-type: none"> Percentage of patients with eye problems who had their visual acuity recorded. 	(4)
<ul style="list-style-type: none"> Percentage of patients who returned and were admitted to the hospital within 48–<72 hours of being seen and discharged from ED. 	(19)	
Chronic Obstructive Pulmonary Disease (COPD)/Asthma	Retained	
	<ul style="list-style-type: none"> Percentage of patients with asthma discharged home from the ED with a prescription/supply for oral steroids (corticosteroids). 	(17;18)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*	
Chronic Obstructive Pulmonary Disease (COPD/Asthma) <i>(continued)</i>	<ul style="list-style-type: none"> Percentage of patients with atrial fibrillation who were treated with or received anti-coagulation drug therapy or an anti-platelet therapy, if indicated. 	(17)	
	<ul style="list-style-type: none"> Percentage of patients with asthma who had an objective measurement of lung function during primary ED assessment (one or more of peak flow, oxygen saturation, FEV₁, spirometry). 	(17 ;31)	
	<ul style="list-style-type: none"> Percentage of patients with asthma admitted to hospital with steroid administration in the ED (IV or oral). 	(17)	
	<ul style="list-style-type: none"> Percentage of patients with chronic obstructive pulmonary disease (COPD) who received corticosteroid therapy in the ED and at discharge (if discharged). 	(31-33)	
	<ul style="list-style-type: none"> Time from arrival in the ED to first documented beta-agonist-type bronchodilator therapy for an acute exacerbation of asthma. 	(18;31)	
	<ul style="list-style-type: none"> Percentage of patients with asthma treated with a beta-agonist-type bronchodilator in the ED. 	(17)	
	Discarded		
	<ul style="list-style-type: none"> ED LOS for patients with asthma. 	*none	
	<ul style="list-style-type: none"> Percentage of patients with asthma who have provision of discharge instructions documented on ED record. 	(18;31)	
	<ul style="list-style-type: none"> Percentage of patients with asthma who receive a chest x-ray during the ED visit. 	(17)	
	<ul style="list-style-type: none"> Percentage of patients with COPD who have arterial blood gas testing in the ED. 	(32)	
	<ul style="list-style-type: none"> Percentage of asthma-related patient deaths in the ED. 	(31)	
	<ul style="list-style-type: none"> Percentage of patients with asthma discharged home from the ED with a short-term medication management written care plan. 	(17)	
	<ul style="list-style-type: none"> Rate of admission for patients with asthma. 	(34)	
	<ul style="list-style-type: none"> Percentage of patients with COPD who received anticholinergic-type bronchodilators in the ED and at discharge (if discharged). 	(32)	
<ul style="list-style-type: none"> Percentage of patients with COPD who had a chest x-ray in the ED. 	(32)		

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*
Chronic Obstructive Pulmonary Disease (COPD/Asthma) <i>(continued)</i>	Borderline	
	<ul style="list-style-type: none"> Percentage of patients with COPD who received antibiotics in the ED and at discharge (if discharged). 	(32)
	<ul style="list-style-type: none"> Percentage of patients with COPD who received beta-agonist-type broncho-dilators in the ED and at discharge (if discharged). 	(32)
Pneumonia	Retained	
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia with delay (>4 hours from arrival) or nonreceipt of antibiotics in the ED. 	(35; 36)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia with an appropriate antibiotic prescribed in the ED. 	(37)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who received initial antibiotic therapy within four hours (or six, or eight, or 24 hours) of arrival. 	(17; 31; 38-40)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who had vital signs (including O₂ assessment) recorded in the ED. 	(38;41)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia with chest x-ray performed to confirm diagnosis. 	(38;42)
	<ul style="list-style-type: none"> Percentage of high-risk patients (Pneumonia Severity Index [PSI] Class 4 or 5) with community-acquired pneumonia patients who were admitted. 	(7)
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia admitted from the ED. 	(31)
	<ul style="list-style-type: none"> Percentage of patients with pneumonia who had blood culture performed (in the ED prior to initial antibiotic received in hospital; within 24 hours). 	(39; 43)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who had a mental status assessment in the ED. 	(44)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who had a PSI completed in the ED. 	(45)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who had a chest x-ray. 	(46)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator ^a
Pneumonia (continued)	<ul style="list-style-type: none"> Mortality rate (30-day) for patients with community-acquired pneumonia. 	(39)
	<ul style="list-style-type: none"> Percentage of patients with community-acquired pneumonia who had an inpatient LOS ≤ two days. 	(18)
	Borderline	
	<ul style="list-style-type: none"> Percentage of patients with pneumonia who underwent oxygenation assessment during their ED visit. 	(7; 31; 39; 47)
Acute Myocardial Infarction (AMI)	Retained	
	<ul style="list-style-type: none"> Percentage of fibrinolytic therapy patients who received fibrinolysis within 30 minutes of hospital arrival. 	(48)
	<ul style="list-style-type: none"> Percentage of patients with Primary Percutaneous Coronary Intervention (PCI) who received their primary PCI within 90 minutes of arrival. 	(31; 48; 49)
	<ul style="list-style-type: none"> Percentage of fibrinolytic therapy patients transported to hospital by ambulance who received fibrinolytic therapy within 60 minutes after call for emergency medical services. 	(48)
	<ul style="list-style-type: none"> Percentage of eligible patients with acute myocardial infarction (AMI) who receive thrombolytic therapy or percutaneous coronary intervention (PCI). 	(7; 48; 50)
	<ul style="list-style-type: none"> Percentage of PCI patients transported to hospital by ambulance who received primary PCI within 120 minutes after call for ambulance. 	(48)
	<ul style="list-style-type: none"> Time from hospital arrival to initial electrocardiogram (ECG) for AMI patients. 	(31;48)
	<ul style="list-style-type: none"> Percentage of patients with AMI who received an electrocardiogram (ECG) within 10 minutes of hospital arrival. 	(48)
	<ul style="list-style-type: none"> Percentage of patients with AMI given ASA within 24 hours before hospital arrival or within three hours of hospital arrival, 24 hours of hospital arrival, during ED stay. 	(48; 51)
	Discarded	
	<ul style="list-style-type: none"> Risk-standardized mortality rate (30-day; in-hospital) for patients with AMI. 	(48; 52; 53)
	<ul style="list-style-type: none"> AMI in-hospital mortality rate (unadjusted). 	(31; 48; 52; 53)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*
Acute Myocardial Infarction (AMI) (continued)	Borderline	
	<ul style="list-style-type: none"> Percentage of patients with AMI transported by ambulance who received a pre-hospital 12-lead ECG. 	(48)
Other Cardiovascular	Retained	
	<ul style="list-style-type: none"> Percentage of patients with atrial fibrillation who are currently treated with anti-coagulation drug therapy or an anti-platelet therapy. 	(54)
	<ul style="list-style-type: none"> Time of arrival in the ED to first ECG for patients with chest pain. 	(4)
	<ul style="list-style-type: none"> Percentage of patients with chest pain who returned to an ED within 72 hours to seven days of an index visit with a confirmed diagnosis of acute myocardial infarction/acute coronary syndrome (AMI/ACS). 	(55)
	<ul style="list-style-type: none"> Percentage of patients with deep vein thrombosis/pulmonary embolism (DVT/PE) who received anticoagulation in the ED. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with chest pain (aged 40 years+) with an ED discharge diagnosis of non-traumatic chest pain who had an ECG performed. 	(56)
	Discarded	
	<ul style="list-style-type: none"> LOS in hospital for DVT patients admitted from the ED. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with chest pain who were admitted to hospital from the ED and received a confirmed diagnosis of AMI/ACS during hospital admission. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with DVT admitted to hospital from the ED. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with DVT/PE who received venous imaging within 36 hours of an index visit to the ED. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with chest pain symptoms in ED who received early therapy including IV, oxygen, nitroglycerin, morphine, and a chewable aspirin on arrival. 	(57)
	<ul style="list-style-type: none"> Percentage of patients with DVT given low-molecular-weight heparin in the ED. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with congestive heart failure who had left ventricular function assessment. 	(58)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*
Other Cardiovascular (continued)	Borderline	
	<ul style="list-style-type: none"> Percentage of patients (aged >18 years) with an emergency department discharge diagnosis of syncope who had an ECG. 	(59)
Sepsis / Infection	Retained	
	<ul style="list-style-type: none"> Time to antibiotics in patients with bacterial meningitis. 	(4)
	<ul style="list-style-type: none"> Percentage of patients with severe sepsis/septic shock for whom a resuscitation bundle incorporating early goal-directed therapy (MMS) was started immediately and completed within six hours of recognition of severe sepsis/septic shock. 	(24)
	<ul style="list-style-type: none"> Percentage of patients with severe sepsis or septic shock who were monitored for lactate clearance. 	(60)
	<ul style="list-style-type: none"> Percentage of patients with severe sepsis or septic shock who were given broad-spectrum antibiotics within four hours of ED arrival. 	(60)
	<ul style="list-style-type: none"> Percentage of severe sepsis/septic shock patients who survived (in-hospital; 28 day; 60 day). 	(60; 61)
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients who received antibiotics in 30 minutes or less. 	(60)
	<ul style="list-style-type: none"> Percentage of patients admitted to hospital for urinary tract infection (UTI). 	(17)
	<ul style="list-style-type: none"> Percentage of patients with severe sepsis/septic shock whose central venous pressure/central venous oxygen saturation monitoring was initiated within two hours. 	(60)
	<ul style="list-style-type: none"> Percentage of patients with severe sepsis/septic shock who were on vasopressor or suspected to have adrenal insufficiency who are given corticosteroid. 	(60)
	Borderline	
	<ul style="list-style-type: none"> Time from first documented contact in the ED to antibiotic administration for febrile neutropenia. 	(3)
Pediatric	Retained	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3 months–3 years) with urinary tract infection who had urine cultures obtained by catheter, suprapubic, or midstream methods. 	(17)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator ^a	
Pediatric (continued)	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 0–1 months) with jaundice who had a bilirubin drawn. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3 months–3 years) with croup who were treated with steroids. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 0–28 days) with fever who received broad-spectrum IV antibiotics. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 0–28 days) with fever who received a full septic workup. 	(17)	
	Discarded		
	<ul style="list-style-type: none"> Percentage of pediatric patients (0–19 years) with Type I diabetes with ketoacidosis treated initially with IV normal saline. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients discharged from the ED with a written care plan. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 28 days–24 months) with a fever whose blood and urine was cultured. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with croup (aged 3 months–3 years) who received a chest or lateral neck x-ray during the ED visit. 	(17)	
	<ul style="list-style-type: none"> Time from triage to initiation of phototherapy for pediatric patients with jaundice. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged <18 years) with a current weight in kilograms documented in the ED record. 	(7; 24)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with seizures who require ventilatory support. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 28 days–24 months) with a fever who had a complete blood count drawn. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients treated with IV therapy who initially received isotonic solutions. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 2–19 years) with an unplanned return visits to any ED within 72 hours of index visit for same/related condition. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with croup (aged 3 months–3 years) with an unplanned return visit to any ED within 24 hours of index visit for same/related condition. 	(17)	

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator*	
Pediatric (continued)	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3 months–3 years) with bronchiolitis who received a chest x-ray. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3 months–3 years) with bronchiolitis who were treated with antibiotics. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 0–28 days) with fever who were admitted to hospital. 	(17)	
	<ul style="list-style-type: none"> Time to antipyretic for pediatric patients (aged 3–24 months) with temperature 38.5 °C if not given in preceding six hours. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3–24 months) with a fever admitted to hospital and with an inpatient LOS < 24 hours. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with UTI whose blood is cultured. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 3–24 months) with a fever who received a chest x-ray during the ED visit. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with minor head injury (aged 0–19 years) who received a skull x-ray. 	(17)	
	Borderline		
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 0–3 months) with a urinary tract infection whose urine is cultured. 	(17)	
	<ul style="list-style-type: none"> Time from triage to administration of antibiotics for pediatric patients (aged 0–28 days) with fever. 	(17)	
	<ul style="list-style-type: none"> Percentage of patients (aged 28–90 days) who presented with a fever and were classified CTAS level 2 who were seen by a physician within 15 minutes. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients who returned to the ED within 72 hours, with critical diagnosis. 	(19)	
	<ul style="list-style-type: none"> Percentage of pediatric patients (aged 28–90 days/3–24 months) with a fever who made an unplanned return visits to any ED within 48/72 hours of index visit for same/related condition. 	(17)	
	<ul style="list-style-type: none"> Percentage of pediatric patients with minor head injury (aged 0–19 years) who received a computed tomography (CT) scan of the head. 	(17)	

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator ^a
Stroke	Retained	
	<ul style="list-style-type: none"> Percentage of potentially eligible patients with acute stroke who had a computed tomography (CT) scan of the brain within 25 minutes of arrival at ED. 	(55)
	<ul style="list-style-type: none"> Percentage of eligible patients with acute stroke who received tissue plasminogen activator (tPA). 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke who were managed on a designated stroke unit. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke who had their blood glucose level checked on arrival at ED or by EMS prior to arrival and regularly for the first 24 hours. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke evaluated for tPA eligibility. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke for whom National Institute of Neurological Disorders and Stroke (NINDS) inclusion/exclusion criteria were applied to determine eligibility for thrombolysis. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke given tPA for whom tPA best-practice treatment protocol was followed for tPA administration. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke ineligible for tPA who received a CT/MRI (magnetic resonance imaging) within 24 hours. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke who had an ECG. 	(55)
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients with acute stroke who received treatment for elevated blood glucose level. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke ineligible for tPA who received a CT/MRI before hospital discharge. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke who are mobilized within 24 hours. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke whose fever was treated with antipyretics. 	(55)
	<ul style="list-style-type: none"> Percentage of patients with acute stroke treated with indwelling urethral catheter. 	(55)

Operational/ Clinical Category	Candidate Indicators, after Round 1 Expert Panel Survey, by indicator status	Source/ reference for each indicator ^a
Stroke (continued)	<ul style="list-style-type: none"> Percentage of patients with acute stroke treated with sublingual nifedipine. 	(62)
	Borderline	
	<ul style="list-style-type: none"> Percentage of patients with acute stroke for whom acute ASA therapy was initiated as soon as possible. 	(55)
Trauma	Retained	
	<ul style="list-style-type: none"> No indicators were retained. 	
	Discarded	
	<ul style="list-style-type: none"> Percentage of patients who did not receive an x-ray at the initial visit and who return to any ED within seven days with the same condition, and subsequently received an x-ray on the return visit. 	(18)
	<ul style="list-style-type: none"> Total time spent in ED by patients with minor injury. 	(4)
	<ul style="list-style-type: none"> Percentage of trauma teams led by advanced trauma life support (ATLS) provider. 	(4)
	<ul style="list-style-type: none"> Percentage of patients with ankle trauma where ankle x-rays that are negative. 	(18)
	<ul style="list-style-type: none"> Percentage of ankle or foot injury patients who received an X-ray. 	(17)
	Borderline	
	<ul style="list-style-type: none"> Percentage of patients with wounds who had tetanus status ascertained and received appropriate antitetanus treatment. 	(4)
	<ul style="list-style-type: none"> Percentage of patients with fractures or dislocations who received analgesics in less than one hour from triage. 	(63)
	<ul style="list-style-type: none"> Time to analgesia in all fractures/femoral fractures. 	(15)
	Mental Health / Neurological	Retained
<ul style="list-style-type: none"> Percentage of psychiatric patients who returned to the ED within 72 hours of an ED visit. 		(64)
Discarded		
<ul style="list-style-type: none"> Percentage of patients not seen by a crisis team in the ED with an outpatient follow-up arranged within seven days. 		(17)
<ul style="list-style-type: none"> Percentage of patients assessed by a crisis team in the ED. 		(17)
<ul style="list-style-type: none"> Percentage of patients with seizure who had a CT scan of the head (excluding febrile seizure). 		(17)
Borderline		
<ul style="list-style-type: none"> Time from ED referral to psychiatric opinion. 	(4)	

1. Loreti M, Tse J. Hospital Report 2007. Emergency Department Care -Patient Satisfaction Technical Summary. Accessed January 04, 2010 at <http://www.ontra.on.ca/library/repository/mon/18000/276261.pdf>.
2. Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med* 2006; 355:2725-32.
3. Wragg C, Piterman H. Emergency department collaborative qualitative evaluation report. 2003. Accessed January 04, 2010 at http://www.nhmrc.gov.au/_files_nhmrc/file/nics/programs/Qualitative%20evaluation.pdf.
4. Beattie E, Mackway-Jones K. A Delphi study to identify performance indicators for emergency medicine. *Emerg Med J* 2004; 21:47-50.
5. Vermeulen MJ, Schull MJ. Missed diagnosis of subarachnoid hemorrhage in the emergency department. *Stroke* 2007; 38:1216-21.
6. Schull MJ, Vermeulen MJ, Stukel TA. The risk of missed diagnosis of acute myocardial infarction associated with emergency department volume. *Ann Emerg Med* 2006; 48:647-55.
7. Graff L, Stevens C, Spate D, Foody J. Measuring and improving quality in emergency medicine. *Acad Emerg Med* 2002; 9:1091-107.
8. Silbergleit R, Kronick SL, Philpott S, Lowell MJ, Wagner C. Quality of emergency care on the night shift. *Acad Emerg Med* 2006; 13:325-30.
9. Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N, Camargo CA, Jr. A conceptual model of emergency department crowding. *Ann Emerg Med* 2003; 42:173-80.
10. Fernandes CM, Price A, Christenson JM. Does reduced length of stay decrease the number of emergency department patients who leave without seeing a physician? *J Emerg Med* 1997; 15:397-9.
11. Canadian Association of Emergency Physicians. Position Statement on Emergency Department Overcrowding. Accessed January 04, 2010 at http://www.caep.ca/CMS/get_file.asp?id=c3a68d63aa5c462e9689c17175f7c6ba&ext=.pdf&name=CA_EP_ED_Overcrowding.pdf.
12. Jimenez JG, Murray JM, Beveridge R, Pons JP, Cortes EA, Garrigos JB, et al. Implementation of the Canadian Emergency Department Triage and Acuity Scale (CTAS) in the Principality of Andorra: Can triage parameters serve as emergency department quality indicators? *CJEM* 2003; 5:315-22.
13. Vertesi L. Does the Canadian Emergency Department Triage and Acuity Scale identify non-urgent patients who can be triaged away from the emergency department? *CJEM* 2009; 6:337-42.
14. Yoon P, Steiner I, Reinhardt G. Analysis of factors influencing length of stay in the emergency department. *CJEM* 2003; 5:155-61.
15. Pines JM, Garson C, Baxt WG, Rhodes KV, Shofer FS, Hollander JE. ED crowding is associated with variable perceptions of care compromise. *Acad Emerg Med* 2007; 14:1176-81.
16. Altmayer CA, Ardal S, Woodward GL, Schull MJ. Variation in emergency department visits for conditions that may be treated in alternative primary care settings. *CJEM* 2005; 7:252-6.
17. Guttman A, Razzaq A, Lindsay P, Zagorski B, Anderson GM. Development of measures of the quality of emergency department care for children using a structured panel process. *Pediatrics* 2006; 118:114-23.
18. Canadian Institute for Health Information. Hospital Report: Emergency Department Care 2007. Accessed January 04, 2010 at http://secure.cihi.ca/cihiweb/products/OHA_ED_07_EN_final_secure.pdf.
19. Hung GR, Chalut D. A consensus-established set of important indicators of pediatric emergency department performance. *Pediatr Emerg Care* 2008; 24:9-15.
20. Clark K, Normile LB. Influence of time-to-interventions for emergency department critical care patients on hospital mortality. *J Emerg Nurs* 2007; 33:6-13.
21. Lane R, Kuzniewicz M, Dean M, Rennie D, Dudley RA. Assessing Emergency Department Length of Stay Prior to ICU Admission as a Key Variable in Case-Mix When Utilizing Risk Adjustment Models for Quality Comparison. 2009. Academy Health Meeting.
22. Tilluckdharry L, Tickoo S, Amoateng-Adjepong Y, Manthous CA. Outcomes of critically ill patients. *Am J Emerg Med* 2005; 23:336-9.
23. British Medical Association. BMA survey of A&E waiting times. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.bma.org.uk/images/AEwaitingtimes_tcm41-20446.pdf.
24. National Quality Forum. National Voluntary Consensus Standards for Emergency Care -Phase II: Hospital-based Emergency Department Care. Accessed January 04, 2010 at http://input.qualityforum.org/news/releases/102908_Emergency%20Department%20Care_FINAL.pdf.
25. Welch S, Augustine J, Camargo CA, Jr., Reese C. Emergency department performance measures and benchmarking summit. *Acad Emerg Med* 2006;13:1074-80.
26. Asaro PV, Lewis LM, Boxerman SB. The impact of input and output factors on emergency department throughput. *Acad Emerg Med* 2007; 14:235-42.
27. Bond K, Ospina MB, Blitz S, Afilalo M, Campbell SG, Bullard M, et al. Frequency, determinants and impact of overcrowding in emergency departments in Canada: a national survey. *Healthc Q* 2007; 10:32-40.
28. Cooke T, Watt D, Wertzler W, Quan H. Patient expectations of emergency department care: phase II—a cross-sectional survey. *CJEM* 2006; 8:148-57.
29. Tse JPC, Milgram L, Baker R, Seeman A, Alikhan LM. Hospital Report 2007: Emergency Department Care System Integration and Change Technical Summary. Accessed January 04, 2010 at http://www.hospitalreport.ca/downloads/2007/EDC/2007_ED_sic_techreport.pdf.
30. Hospital Emergency Department and Ambulance Effectiveness (HED&AE) Working Group. Improving Access to Emergency Services: A System Commitment. Accessed January 04, 2010 at http://www.health.gov.on.ca/english/public/pub/ministry_reports/emerg_dept_05/emerg_dept_05.pdf.
31. Lindsay P, Schull M, Bronskill S, Anderson G. The development of indicators to measure the quality of clinical care in emergency departments following a modified-delphi approach. *Acad Emerg Med* 2002; 9:1131-9.
32. Bach PB, Brown C, Gelfand SE, McCrory DC. Management of acute exacerbations of chronic obstructive pulmonary disease: a summary and appraisal of published evidence. *Ann Intern Med* 2001; 134:600-20.
33. Cydulka RK, Rowe BH, Clark S, Emerman CL, Camargo CA, Jr. Emergency department management of acute exacerbations of chronic obstructive pulmonary disease in the elderly: the Multicenter Airway Research Collaboration. *J Am Geriatr Soc* 2003; 51:908-16.
34. National Quality Measures Clearinghouse: AHRQ. Adult asthma: hospital admission rate. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=12781&string=adult+AND+asthma+AND+admission+AND+rate.
35. Anaisie E. Antimicrobial coating of central venous catheters: show me the data. *Crit Care Med* 2007; 35:1197-9.
36. National Quality Measures Clearinghouse: AHRQ. Pneumonia: percent of patients who receive their first dose of antibiotics within 6 hours after arrival at the hospital. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=13224&string=Pneumonia+AND+hours.
37. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients aged 18 years and older with the diagnosis of community-acquired bacterial pneumonia with an appropriate empiric antibiotic prescribed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=10322&string=emergency+AND+medicine+AND+18+AND+years+AND+pneumonia.
38. Fee C, Weber EJ, Maak CA, Bacchetti P. Effect of emergency department crowding on time to antibiotics in patients admitted with community-acquired pneumonia. *Ann Emerg Med* 2007; 50:501-9, 509.
39. Meehan TP, Fine MJ, Krumholz HM, Scinto JD, Galusha DH, Mockalis JT, et al. Quality of care, process, and outcomes in elderly patients with pneumonia. *JAMA* 1997; 278:2080-4.
40. National Quality Measures Clearinghouse: AHRQ. Pneumonia: percent of immunocompetent patients with community-acquired pneumonia who receive an initial antibiotic regimen during the first 24 hours that is consistent with current guidelines. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=13225&string=immunocompetent+AND+pneumonia.
41. National Quality Measures Clearinghouse: AHRQ. Community-acquired bacterial pneumonia: percentage of patients with vital signs recorded. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=9053&string=CAP+AND+vital+AND+signs.
42. National Quality Measures Clearinghouse: AHRQ. Community-acquired pneumonia (CAP) in adults: percentage of patients with a diagnosis of CAP that had a chest x-ray to confirm diagnosis. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=9400&string=CAP+AND+chest+x-ray.
43. National Quality Measures Clearinghouse: AHRQ. Pneumonia: percent of patients whose initial emergency room blood culture specimen was collected prior to first hospital dose of antibiotics. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=13220&string=pneumonia+AND+blood+AND+culture.
44. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients aged 18 years and older with the diagnosis of community-acquired bacterial pneumonia with mental status assessed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=10321&string=pneumonia+AND+mental+AND+status.
45. Flanders WD, Tucker G, Krishnasadan A, Martin D, Honig E, McClellan WM. Validation of the pneumonia severity index. Importance of study-specific recalibration. *J Gen Intern Med* 1999; 14:333.
46. National Quality Measures Clearinghouse: AHRQ. Community-acquired bacterial pneumonia: percentage of patients with a chest x-ray performed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=9051&string=pneumonia+AND+chest+x-ray.
47. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients aged 18 years and older with the diagnosis of community-acquired bacterial pneumonia with oxygen saturation documented and reviewed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=10320&string=emergency+AND+medicine+AND+pneumonia.
48. Tu JV, Khalid L, Donovan LR, Ko DT. Indicators of quality of care for patients with acute myocardial infarction. *CMAJ* 2008; 179:909-15.
49. National Quality Measures Clearinghouse: AHRQ. Acute myocardial infarction: percent of patients receiving primary PCI during the hospital stay with a time from hospital arrival to PCI of 90 minutes or less. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at <http://www.qualitymeasures.ahrq.gov/summary/summary>.

aspx?doc_id=13206&string=AMI+AND+90+ AND+minutes.

50. Tran CT, Lee DS, Flintoft VF, Higginson L, Grant FC, Tu JV, et al. CCORT/CCS quality indicators for acute myocardial infarction care. *Can J Cardiol* 2003; 19:38-45.
51. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients with an emergency department discharge diagnosis of AMI who had documentation of receiving aspirin within 24 hours before emergency department arrival or during emergency department stay. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at <http://www.qualitymeasures.ahrq.gov/summary/s>.
52. Bradley EH, Herrin J, Elbel B, McNamara RL, Magid DJ, Nallamothu BK, et al. Hospital quality for acute myocardial infarction: correlation among process measures and relationship with short-term mortality. *JAMA* 2006;296:72-8.
53. National Quality Measures Clearinghouse: AHRQ. Acute myocardial infarction (AMI): mortality rate. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=12751&string=AMI+AND+Mor tality.
54. National Quality Measures Clearinghouse: AHRQ. Atrial fibrillation: the percentage of patients with atrial fibrillation who are currently treated with anti-coagulation drug therapy or an anti-platelet therapy. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=12903&string=atrial+AND+fibr illation.
55. Lindsay MP, Kapral MK, Gladstone D, Holloway R, Tu JV, Laupacis A, et al. The Canadian Stroke Quality of Care Study: establishing indicators for optimal acute stroke care. *CMAJ* 2005; 172:363-5.
56. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients aged 40 years and older with an emergency department discharge diagnosis of non-traumatic chest pain who had a 12-lead ECG performed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=10316&string=Emergency+A ND+Medicine+AND+40+AND+12-lead.
57. National Quality Measures Clearinghouse: AHRQ. Diagnosis and treatment of chest pain and acute coronary syndrome (ACS): percentage of patients with chest pain symptoms in the emergency department receiving early therapy including intravenous access, oxygen, nitroglycerin, morphine and a chewable aspirin on arrival. National Quality Measures Clearinghouse: AHRQ. http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=13516&string=ACS+AND+pai
58. Lee DS, Tran C, Flintoft V, Grant FC, Liu PP, Tu JV. CCORT/CCS quality indicators for congestive heart failure care. *Can J Cardiol* 2003; 19:357-64.
59. National Quality Measures Clearinghouse: AHRQ. Emergency medicine: percentage of patients aged 18 years and older with an emergency department discharge diagnosis of syncope who had a 12-lead ECG performed. National Quality Measures Clearinghouse: AHRQ. Accessed January 04, 2010 at http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=10316&string=Emergency+A ND+Medicine+AND+40+AND+12-lead.
60. Nguyen HB, Corbett SW, Steele R, Banta J, Clark RT, Hayes SR, et al. Implementation of a bundle of quality indicators for the early management of severe sepsis and septic shock is associated with decreased mortality. *Crit Care Med* 2007; 35:1105-12.
61. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med* 2001; 345:1368-77.
62. Snyder C, Anderson G. Do quality improvement organizations improve the quality of hospital care for Medicare beneficiaries? *JAMA* 2005;293:2900-7.
63. Weingarten S, Riedinger MS, Sandhu M, Bowers C, Ellrodt AG, Nunn C, et al. Can practice guidelines safely reduce hospital length of stay? Results from a multicenter interventional study. *Am J Med* 1998; 105:33-40.
64. Francis RC, Spies CD, Kerner T. Quality management and benchmarking in emergency medicine. *Curr Opin Anaesthesiol* 2008; 21:233-9.