

## Annexure B 2: Characteristics of articles found

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Authors, publication date, country	Research aim (s)	Methods: study design, population, tools used, study duration	QIs and formula or definition identified	Description of participants	Results
Altafin <i>et al.</i> , (2014) Brazil	To evaluate the nursing workload in an adult ICU of a university hospital using the NAS instrument and to analyze the effects that demographic and clinical characteristics have on their workload.	A longitudinal, prospective study involving patients admitted to the adult ICU between March 10, 2008 and December 31, 2008. Therapeutic Intervention Score System (TISS 28) and Nursing Activity Score (NAS) were used to measure and characterize the nursing workload in the ICU, in addition to the Acute Physiology and Chronic Health Evaluation (APACHE II) severity score and Sequential Organ Failure Assessment (SOFA) organ dysfunction score to characterize patient severity	<ul style="list-style-type: none"> <li>Professional nurse per ICU bed.</li> <li>NAS score: percentage of time spent by the nursing staff caring for critically ill patients i.e., it represents how much of a staff member's working time was required by a patient over the last 24 hours. A score of 100 points indicates that a patient required 100% of the nurse's time in the past 24 hours. Each point in the NAS is equivalent to providing 14.4 minutes of nursing care.</li> </ul>	Patients admitted consecutively to the ICU during the study period	<ul style="list-style-type: none"> <li>A total of 437 patients were evaluated. The type of admission, length of stay in the ICU and condition at discharge from the ICU and hospital were the variables associated with differences in nursing workload.</li> <li>the mean NAS-Admission with the APACHE II, mean SOFA-Admission and mean TISS-28-Admission were significant (<math>p &lt; 0.001</math>)</li> <li>The high mean NAS observed in the study reflects that each patient required more than half of the nursing workload, thus suggesting an ideal proportion of one nurse professional per ICU bed.</li> </ul>

## Annexure B 2: Characteristics of articles found

Berenholtz <i>et al.</i> , (2014) USA	To evaluate the impact of the national program on CLABSI rates.	A collaborative cohort study Implemented in 1,071 adult ICUs from 44 states, reporting 27,153 ICU-months and 4,454,324 catheter-days of data. Duration of reporting: between 1-18months	<ul style="list-style-type: none"> <li>Central line–associated bloodstream infections (CLABSIs): reported as cases per catheter days</li> </ul>	<ul style="list-style-type: none"> <li>Nurse leaders</li> <li>Frontline nurses</li> <li>Ancillary staff</li> <li>Unit-level physician</li> <li>Infection preventionist</li> <li>Hospital quality and safety leaders;</li> <li>Senior executives</li> </ul>	<ul style="list-style-type: none"> <li>The overall mean CLABSI rate significantly decreased from 1.96 cases per 1,000 catheter-days at baseline to 1.15 cases at the sixth quarter after implementation</li> <li>The number of ICUs per quarter that achieved a mean CLABSI rate of less than 1 case per 1,000 catheter-days increased from 461 (56%) at baseline to 661 (70%)</li> <li>Statistically significant decrease in CLABSI rates were demonstrated during all the observation periods compared with baseline</li> </ul>
Coombs <i>et al.</i> , (2016) New Zealand	To find out how nurses prepare families for and support families during withdrawal of life-sustaining treatments in intensive care	An integrative literature review using data sources MEDLINE, CINAHL plus, PsychINFO, PUBMED, Scopus, EMBASE and Web of Knowledge, searched for papers published between 2000 to May 2015	<ul style="list-style-type: none"> <li>Clear articulation of care given by nurses to patient and family</li> <li>Information and communication</li> <li>Managing withdrawal of life-sustaining treatment               <ul style="list-style-type: none"> <li>How individual treatments are withdrawn</li> <li>Timing of withdrawal</li> <li>Managing resultant symptoms from withdrawal</li> </ul> </li> <li>Continuing to care               <ul style="list-style-type: none"> <li>Preparing the patient</li> <li>Emotional support</li> </ul> </li> </ul>	ICU nurses	<ul style="list-style-type: none"> <li>24 out of 479 papers included in analysis</li> <li>Most studies focussed on withdrawal of life –sustaining treatments as part of an exploration of end of life care</li> <li>Three themes emerged on how nurses prepare and support families:               <ul style="list-style-type: none"> <li>Equipping families for end of life through information and communication</li> <li>Managing the withdrawal of life-sustaining treatment</li> </ul> </li> </ul>

## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>○ Adapting the environment</li> <li>○ Nurse presence with the family</li> <li>○ Creating memories</li> </ul>		<ul style="list-style-type: none"> <li>○ Continuing to care</li> </ul>
Danielis <i>et al.</i> , (2019) Italy	To explore the characteristics of the available studies on nursing sensitive outcomes in the ICU; and To identify all reported outcomes used to date to measure the contribution of nursing care in this setting.	<ul style="list-style-type: none"> <li>• A scoping review</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure ulcers: prevalence and/or incidence rate using Norton Scale (risk identification)</li> <li>• Ventilator-associated pneumonias: prevalence and/or incidence rate</li> <li>• Physiological parameters: patient bedside monitor</li> <li>• Delirium: Confusion-Assessment Method-ICU; Intensive Care Delirium Screening Checklist; Neecham tool and/or Confusion-Assessment Method-ICU; Automatic Prediction of Delirium</li> <li>• Central Line-Associated Bloodstream Infections: prevalence and/or incidence rate</li> <li>• Mortality: ICU mortality; 30-day mortality; In-hospital mortality</li> <li>• ICU length of stay: number of ICU days</li> <li>• Length of mechanical ventilation: number of ventilator days</li> </ul>	<ul style="list-style-type: none"> <li>• Critically-ill adult patients admitted to the ICU.</li> </ul>	<ul style="list-style-type: none"> <li>• The most studied outcome was pressure ulcers (n = 20), followed by ventilator-associated pneumonias (n = 19), physiological parameters (n = 14), and delirium (n = 13).</li> <li>• The least often studied outcomes were quality of life, secretion clearance, patient-ventilator dysynchrony, and post-extubation dysphagia, all reported in only one study respectively.</li> <li>• The measurement systems used included instruments/tools (e.g., Confusion-Assessment Method-ICU), direct clinical measures (e.g., level of glycemia), administrative data (e.g., length of stay), and patients' narratives (e.g., interviews and informal conversations).</li> <li>• 22 studies did not report a description outcome</li> <li>• Outcomes most often studied are those regarding safety (n =</li> </ul>

## Annexure B 2: Characteristics of articles found

					77, 33.1%), followed by clinical (n = 72, 30.9%), functional (n = 70, 30.0%), and perceptual (n = 14, 6.0%) domains
Driscoll <i>et al.</i> , (2018) USA, UK, Australia	To identify studies conducted in acute specialist units, which examine the association between nurse staffing levels (NPRs) and nurse-sensitive patient outcomes.	A systematic review by searching electronic databases and grey literature (Medline (OvidSP), Medline in Process (OvidSP), CINAHL (Cumulative Index to Nursing and Allied Health Literature) (EBSCO), PsycInfo (OvidSP), Embase (OvidSP), HMIC (Health Management Information Consortium) (OvidSP), Cochrane Database of Systematic Reviews, Web of Science; Science Citation Index Expanded (ISI Web of Knowledge), Web of Science	<p>Nurse per patient ratio (NPR)</p> <ul style="list-style-type: none"> <li>the number of nurses working per shift or over a 24-hour period divided by the number of beds occupied by a patient over the same time period; or</li> <li>the number of nursing hours per patient bed days (NHPPD)</li> </ul> <p>Postoperative in-hospital mortality in ICU</p> <ul style="list-style-type: none"> <li>Unplanned readmission to ICU or operating theatre</li> <li>Unplanned readmission and/ or in-hospital mortality in the general wards</li> <li>Cardio pulmonary resuscitation</li> <li>Falls</li> <li>Falls with injury</li> <li>Hospital-acquired pressure ulcers</li> <li>Medication occurrences</li> <li>Restraint use</li> <li>Monthly mortality</li> <li>Ventilator days</li> <li>ICU length of stay</li> </ul>		<p>This analysis found that a higher level of nurse staffing was associated with a decrease in the risk of in hospital mortality (OR 0.86, 95% CI 0.79–0.94) and nurse-sensitive outcomes. In ICUs, they found a higher number of NHPPD was associated with a lower FTR rate. Patients cared for with a higher number of NHPPD were 68% less likely to experience bloodstream infections (95% CI 0.15–.17), 79% less likely to experience pneumonia (95% CI 0.08–0.53) and there was a 31% reduction in risk for a decubitus pressure ulcer (95% CI 0.49–0.98). Median NPR (per shift): 1:1.5 and IQR 1:1.3 -1:1.8. In univariate analysis lower NPRs were associated with fewer nosocomial infections (RR 0.42, 95% CI 0.32–0.55). In multivariate analysis, NPR was not associated with nosocomial infections.</p>

## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>• In-hospital mortality</li> <li>• Incidence of VAP</li> <li>• Use of physical restraints</li> <li>• Annual mortality</li> <li>• ICU-acquired infections</li> <li>• Early onset VAP Late onset VAP</li> <li>• Duration of ventilation</li> <li>• Hospital length of stay</li> <li>• Mortality at time of ICU discharge by shift</li> <li>• Quality of care was</li> <li>• Failure to rescue</li> <li>• mortality in surgical patients preceded by a hospital-acquired complication such as pneumonia, DVT, pulmonary embolism, sepsis, acute renal failure, shock or cardiac arrest and gastrointestinal haemorrhage or acute ulcer)</li> <li>• Nosocomial device associated infections:</li> </ul>		<p>As the NHPPD decreased so did the risk of developing shock increase 3-fold (RR 3.48, Average NHPPD was 17 (SD+5.1) Higher NHPPD were significantly associated with a lower incidence rate of:</p> <ul style="list-style-type: none"> <li>• 30-day mortality (OR 0.81, 95% CI 0.69–0.95, <math>P \leq 0.001</math>)</li> <li>• CLBSI (OR 0.32, 95%CI 0.15–0.70, <math>P \leq 0.05</math>)</li> <li>• Decubiti (OR 0.69, 95% CI 0.49–0.98, <math>P \leq 0.01</math>)</li> <li>VAP (OR 0.21, 95%CI 0.08–0.53, <math>P \leq 0.05</math>)</li> </ul> <p>Average nursing hours to weighted patient cases was 36.2 (SD+9.3) Increase in number of nursing hours was associated with six fewer deaths for every 1000 discharged patients</p> <p>Median NPR:</p> <p>Day shift: 1.3 (IQR 1.0–1.8)</p> <p>Evening shift: 1.6 (IQR 1.2–2.0)</p> <p>Night shift: 2.0 (IQR 1.4–2.5) As the NPR increased, patients were 30% more likely to experience a parental medication error (OR 1.3, 95% CI 1.03–1.64, <math>P = 0.03</math>) (multivariate regression)</p> <p>The mean acuity-adjusted nursing hours per patient day (NHPPD) was 2.62 (SD=0.29) No significant association was found between NHPPD and patient outcomes</p>
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			<ul style="list-style-type: none"> <li>• number of ventilator infections</li> <li>• number of central venous catheter associated infections per 1000 device days</li> <li>• Deep vein thrombosis</li> <li>• Pneumonia</li> <li>• Upper GI bleed</li> <li>• Parenteral medication errors: wrong dose, wrong drug, wrong route, wrong time, missed medication</li> <li>• Postoperative complications Postoperative respiratory failure Urinary tract infections</li> <li>• Hospital-acquired pneumonia</li> <li>• Hospital-acquired sepsis</li> </ul>		<p>They estimated that 121 infections could be avoided if the NPR &lt;2.2</p> <p>NPR was variable; 1:2 in (5 units), 1:3 in (10 units) and 1:4 or more (13 units)</p> <p>Lower NPR (1:2) was independently associated with a lower 28-day mortality (HR 0.459, 95% CI 0.211–0.998)</p> <p>NPRs ranged from 1:1 to 1:&gt;2.5</p> <p>As NPRs increased the risk of death increased- by a factor of 3.5 (1.3–9.1) when the NPR was &gt;2.5</p> <p>15.52 NHPPD (2.03 SD)</p> <p>Statistically significant association between higher NHPPD and lower rates of failure to rescue in ICUs</p> <p>Average total nursing hours per patient day in ICU was 15.98 (SD 3.42)</p> <p>A higher number of NHPPD was associated with lower fall rates (OR 0.95, 95% CI 0.94–0.97, P&lt;0.001)</p> <p>Average total nursing hours per patient day was 15.98 (SD 3.42)</p> <p>A decrease of NPR by one patient was associated with a 30% infection risk reduction in univariate analysis. Association remained unchanged in multivariate model, indicating that</p>
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## Annexure B 2: Characteristics of articles found

					<p>none of the other variables examined were true confounding factors</p> <p>Median daily NPRs were 1.9 nurse per patient; range 1.4–5.3 (IQR 1.8–2.2)</p> <p>A lower NPR ratio was associated with a decreased risk for late-onset VAP (HR 0.42, 95% CI 0.18–0.99)</p> <p>NPR varied from 1:1 to 1:4</p> <p>Number of restraints increased as the NPR increased (<math>\chi^2=17.17</math> <math>P=0.001</math>) or every increase of one patient per nurse there was a 3.7% increase in annual ICU</p> <p>Average total NHPPD ranged from 9.56 (SD<math>\pm</math>0.4) in medical/surgical wards to 18.27 (SD<math>\pm</math>3.9) in CCUs</p> <p>Significant correlation between higher total NHPPD and lower incidence of hospital acquired pressure ulcers (<math>P&lt;0.05</math>).</p> <p>Significant correlation between lower restraint use with higher NHPPD (<math>P&lt;0.05</math>) No significant correlations between all other outcome measures and total NHPPD</p> <p>Mean NPR 1:0.50</p>
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## Annexure B 2: Characteristics of articles found

					<p>Lower NPRs were associated with lower ventilator days (OR -2.08, 95% CI -5.377 to -0.166, P=0.037)</p> <p>Secondary care intensive care unit NPR: 1:0.98</p> <p>Every additional patient per nurse resulted in a 9% increase in the odds of death (OR 1.09, 95% CI 1.04–1.14)</p> <p>Each additional patient cared for by a nurse would result in an additional 15 deaths per 1000 patients</p> <p>NPR varied from 1: 1 to 1:3</p> <p>VAP incidence was significantly lower in ICU units with 1:1 NPR compared to units with a ratio of &gt;1:1 (9.3% vs. 24.4%, P=0.002) (univariate analysis)</p>
Dubois <i>et al.</i> , (2017) Canada	To determine an optimal set of indicators that can be used on a priority basis to assess the performance of nursing care providers and their contribution to healthcare system performance	Reaching a consensus on which indicators can be used on priority basis in three steps: 1.Establishing a preliminary list of indicators that appears most frequently in the literature for in-depth analysis	<ul style="list-style-type: none"> <li>Quantity and intensity of nursing resources</li> <li>Composition of care team</li> <li>Number of continuous hours worked</li> <li>Nursing interventions for prevention and promotion</li> <li>Symptom management (pain and fatigue)</li> <li>Discharge planning</li> <li>Pressure ulcers</li> <li>Medication management errors</li> <li>Urinary infections</li> </ul>	<ul style="list-style-type: none"> <li>Nursing research experts</li> </ul>	<p>25 indicators were identified in the first step</p> <p>These were reduced to 12 based on the 5 criteria</p>



## Annexure B 2: Characteristics of articles found

	based on the most up-to-date scientific knowledge with regard to scientific evidence to the nursing sensitivity attribute; relevance or importance; feasibility; potential for bench marking; and usability	2. Listing the theoretical and empirical evidence supporting each of the selected indicators and confirming that they are related to nursing 3. Independently rating each one of the indicators in the preliminary list by an expert panel based on 5 pre-determined criteria	<ul style="list-style-type: none"> <li>Falls</li> <li>Length of stay</li> <li>Readmissions</li> </ul>		
Duszynska <i>et al.</i> , (2016) Poland	To evaluate the incidence of UTI in ICU patients, to determine their aetiological factors, to assess the compliance with the preventive recommendation and to compare the trend of CAUTIs with international reports and findings from earlier studies	A prospective study in surgical-medical ICU between 01.01.2012 and 31.12.2014. Data recorded daily in infection surveillance cards	<ul style="list-style-type: none"> <li>Device utilization ratio (DUR): determining the percentage of patients with urinary catheters <math>UCU-R = \text{number of in-dwelling catheter days} \div \text{total number of patient days} \times 100</math></li> <li>Incidence of density of UTIs: <math>UTI \text{ density ratio} = \text{number of patients with UTIs} \div \text{total number of catheter-days} \times 1000</math></li> <li>Incidence rate i.e. number of new cases per unit time – a year (2012, 2013, 2014) – per 100 ICU admissions</li> </ul>	Patients with indwelling catheters for longer than 48 hours	UTI diagnosed in 91 (7%) out of 1261 ICU patients during 14006 person-days of hospitalization Incidence rate: 7.22/100 patients admitted to the ICU. CAUTI constituted 36% (n= 255) of total number of hospital acquired infections over the study period. Total number of catheter utilization days was 12917 Incidence of CAUTI was 6.81 (3.02 – 9.18) per 1000 catheter-days. Central catheter utilization rate was 92.21±4.51%. Bundle element most strictly observed was prevention of improper catheter location.

## Annexure B 2: Characteristics of articles found

Evangelou <i>et al.</i> , (2020) Cyprus	To identify potential nursing QIs for adult ICUs through a survey and expert consensus process	Validated QIs initially identified via a systematic literature review by the same author was presented to 2 different expert panels from Europe and Cyprus to reach a consensus on feasibility, representativeness and importance based on agreement on a 4-point Likert scale. Those attaining 60% consensus were further subjected to a 3rd expert panel in a face-to-face consensus meeting.	<ul style="list-style-type: none"> <li>• Surgical wound</li> <li>• Application of physical restraints</li> <li>• patient falls</li> <li>• health care associated VAP</li> <li>• Accidental removal of IV catheters</li> <li>• Removal of NGT occasioned by occlusion</li> <li>• Unplanned extubation</li> <li>• MDR</li> <li>• Healthcare (ICU) associated UTI</li> <li>• Medication administration errors</li> <li>• Pressure ulcers</li> <li>• Health care associated (ICU) central line infections (CLBSI)</li> <li>• Readmission rates</li> <li>• Ventilator days</li> <li>• Standardized mortality rates</li> <li>• LOS</li> </ul>	Nursing research experts	To identify potential nursing QIs for adult <ul style="list-style-type: none"> <li>• ICUs through a survey and expert consensus process</li> </ul>
Evangelou <i>et al.</i> , (2018) Cyprus	To identify potential QIs, specifically patient-centred clinical NSOs, that may be measured in the ICU and have been found to be associated with variables	An integrative literature review focused on search of electronic databases Ovid Medline, PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Cochrane library for relevant articles	<ul style="list-style-type: none"> <li>• Falls: annual rates per 1000 patient days</li> <li>• Medication administration errors: annual rates per 1000 patient days</li> <li>• Skin breakdowns: annual rate per 1000 patient days</li> <li>• Urinary tract infection: annual rate per 1000 patient days</li> </ul>	Nursing research experts	To identify potential QIs, specifically patient-centred clinical NSOs, that may be measured in the ICU and have been found to be associated with variables reflecting the quantity and/or quality of nursing care, and to assess the methodological quality of the QIs identified.

## Annexure B 2: Characteristics of articles found

	reflecting the quantity and/or quality of nursing care, and to assess the methodological quality of the QIs identified.	published between 2000 and 2016.	<ul style="list-style-type: none"> <li>• Central catheter line infection: annual rate per 1000 patient days</li> <li>• Blood stream infection: annual rate per 1000 patient days</li> <li>• Mortality: deaths that occurred in the hospital or on the date of hospital discharge</li> <li>• Complications related to mortality and are nurse sensitive:</li> <li>• Cardiac complications: - acute MI (ICD-9-CM code: 410); arrest (ICD9-CM code: 4275)</li> <li>• Complications after a procedure</li> <li>• Respiratory complications: pulmonary insufficiency after a procedure; reintubation; aspiration; ventilation &gt; 96 hrs</li> <li>• Other complications: acute renal failure; septicaemia: platelets transfusion</li> <li>• hospital LOS; cost</li> <li>• postoperative infection; aspiration; reintubation; pulmonary insufficiency; pneumonia; septicaemia; cardiac complications; cardiac arrest; acute MI; renal failure; reoperation for bleeding; surgical complications</li> </ul>		
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## Annexure B 2: Characteristics of articles found

			<p>system complications, skin and muscular system, management complications: All definitions of critical incidents and categorization of complications were listed including diagnostic criteria</p> <ul style="list-style-type: none"> <li>• Sentinel events. All sentinel events were presented as rates per 100 patient days</li> <li>• Airway: unplanned extubation - artificial airway obstruction; cuff leakage; prompting reintubation</li> <li>• Indwelling lines: iv cannulas and the attachment fluid delivery sets; catheters: arterial line, CVP, pulmonary artery catheters, folley, dialysis; probes and drains: unplanned dislodgment, inappropriate, disconnection of chest drain and nasogastric tubes</li> <li>• Equipment failure: infusion devices; ventilator and accessories; renal replacement devices; power and oxygen supply</li> <li>• Alarms: inappropriate turn off</li> <li>• NGT loss: definition of ANA, National Database of Nursing QIs</li> </ul>		
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## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>• CVC loss: number of CVC losses/ number of patients with CVC per day x 100</li> <li>• Extubation incidence: definition of ANA, National Database of Nursing QI</li> <li>• VAP: according to definition and formula of NNIS protocols</li> <li>• UTI: according to definition and formula of NNIS protocols</li> <li>• 30-day mortality: the date of index admission in inpatient standard analytic file to the date of death in the denominator file,</li> </ul>		
Floroff <i>et al.</i> , (2014) USA	<p>To investigate the use of PIMs and DBI and their associations with clinical outcomes in critically ill elderly patients with neurological injury during their admission in the neuroscience ICU (NSICU). Specific aims were:</p> <ul style="list-style-type: none"> <li>• Identify PIMs and determine a</li> </ul>	<p>Retrospective review of medical records of consecutive critically ill adult patient <math>\geq 65</math> years of age admitted to the NSICU of Virginia Commonwealth University from March 2011 to July 2011 to identify PIMs in these patients and use these values to calculate DBI.</p>	<ul style="list-style-type: none"> <li>• Potentially Inappropriate Medication (PIM) described as a medication having potential risks that outweigh its potential benefit in an elderly patient measured as prevalence (%) using Medication Appropriateness Index, or Beers Criteria, or STOPP and/or START</li> </ul> <p>Drug Burden Index (DBI) is a measure of use of specific PIM with anticholinergic and/or sedative properties calculated for each medication by dividing the daily dose by the recommended minimum daily dose (Dose/Minimum Daily Dose). Total</p>	•	<p>There were 112 critically ill elderly NSICU patients included in this study.</p> <ul style="list-style-type: none"> <li>• Of these, 76 patients received B2 intermittent PIMs and 36 received <math>&gt;2</math> int PIMs during NSICU admission</li> <li>• The median (IQR) NSICU LOS, during which PIMs were prescribed, was <math>&lt;2</math> days for patients who received B2 intPIMs and <math>&lt;4</math> days for patients who received <math>&gt;2</math> intPIMs.</li> <li>• A change in RASS score occurred with 50 PIM doses. RASS scores decreased with 28 (56 %) PIM doses and were</li> </ul>

## Annexure B 2: Characteristics of articles found

	<p>DBI for patients</p> <ul style="list-style-type: none"> <li>Determine if a change in neurological status occurred pre- to post-PIM dosing, using the GCS and RASS scores as measures of neurological status.</li> </ul> <p>Determine if the number of PIMs administered during the ICU stay and DBI is associated with clinical outcomes.</p>		<p>DBI is determined by summing the daily DBI for each PIM. Minimum daily dose is identified by means of Physician's Desk Reference and the product information of each PIM.</p>		<p>most frequently associated with opioid use</p> <ul style="list-style-type: none"> <li>The median NSICU LOS and hospital LOS for patients who received B2 intPIMs, as compared to those with &gt;2 intPIMs, were shortened by 2.16 and 4.5 days (<math>p &lt; 0.001</math>). There was no statistically significant difference in mortality between groups</li> </ul>
Foster <i>et al.</i> , (2020) Australia and New Zealand	To investigate the prevalence of discharge delay and the association between discharge delay and patient outcomes including hospital	A retrospective study using data from the Adult Patient Database, collected from de-identified individual patient data for all patients discharged alive to a ward, from their first ICU admission in the	<ul style="list-style-type: none"> <li>Discharge delay: mortality and readmission rates to ICU declines with increasing discharge delay, in patients with high severity of illness on admission to ICU.</li> <li>Hospital mortality</li> <li>Readmission to ICU</li> <li>Length of stay</li> </ul>	Adult ICU patients	<p>1,014,540 patients were discharged alive from 190 ICUs to a ward.</p> <p>Overall, 756,131 (75%) of patients left the ICU within 6 hours of being deemed ready for discharge</p> <p>The majority of patients were deemed ready (time of day when the decision was made) for discharge between 9 and 11 A.M.</p> <p>Discharges from ICU increased</p>

## Annexure B 2: Characteristics of articles found

	mortality, readmission to ICU, and length of hospital stay after ICU discharge.	contributing hospitals between January 2011 and December 2019 inclusive.			<p>between 2011 and 2019, and longer discharge delays become more frequent</p> <p>The overall mortality was 3.1%, with the lowest unadjusted mortality seen in those who were discharged within 6 hours of a decision that the patient was ready to leave</p> <p>Discharge delay between 24 and 72 hours was associated with a lower odds of mortality. This was lowest between 48 and 72 hours (OR, 0.87; 95% CI, 0.79–0.94).</p> <p>Adjusted in-hospital mortality was highest when the decision for ICU discharge occurred in the evening (OR, 1.26; 95% CI, 1.19–1.34).</p> <p>There was a statistically significant interaction between categories of baseline risk and discharge delay (<math>P&lt;0.001</math>).</p>
Fraser <i>et al.</i> , (2015) USA	To assess four nurse-sensitive quality-of-care indicators: falls, ventilator-associated events, pressure ulcers, and catheter-associated	A retrospective chart review of 66 ICU patients receiving routine care and 66 receiving early mobility. Richmond Agitation–Sedation Scale (RASS) scores, delirium days, and functional outcomes	<ul style="list-style-type: none"> <li>• National Database of Nursing Quality Indicators data collection and submission guidelines was used to indicate the presence of falls, ventilator associated events, pressure ulcers, and CAUTI</li> <li>• Sedation levels was measured by RASS score or CAM-ICU</li> </ul>	<ul style="list-style-type: none"> <li>• Critical care RN</li> <li>• Physical therapist</li> <li>• Respiratory therapists (RTs)</li> </ul>	<ul style="list-style-type: none"> <li>• 15 patients (23%) in the routine care group were readmitted to the ICU within 30 days, whereas only seven patients (11%) in the mobility group were readmitted</li> <li>• The routine care group had two falls, one ventilator-associated event, two pressure ulcers, and 12</li> </ul>



## Annexure B 2: Characteristics of articles found

	urinary tract infections [CAUTIs]), as well as hospital costs, and sedation levels	using Barthel Index scores was used to compare outcomes in patients who received an early mobility intervention from a dedicated mobility team with ICU patients who received routine care			<p>CAUTIs compared with the mobility group, which had only one CAUTI.</p> <ul style="list-style-type: none"> <li>• The mean ICU length of stay was slightly shorter in the mobility group than in the routine care group (6.4 versus 6.5 days)</li> <li>• The mean hospital length of stay was longer in the mobility group than in the routine care group (12.6 versus 10.6 days).</li> <li>• In-hospital mortality occurred in nine routine care patients (14%) versus no deaths occurred in the mobility patients.</li> <li>• Compared with the routine care group, 12 additional mobility group patients were discharged to rehabilitation</li> <li>• The mean cost per patient was lower in the mobility group than in the routine care group (\$125,309 versus \$127,000)</li> <li>• Deeper sedation in the routine care group (RASS score -2.18) versus greater wakefulness (RASS score -0.82) in the mobility group</li> <li>• The mobility group also had significantly fewer delirium</li> </ul>
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## Annexure B 2: Characteristics of articles found

					<p>days, as measured by CAM-ICU, than the routine care group.</p> <ul style="list-style-type: none"> <li>• The mean Barthel Index score for the mobility group increased significantly from 45.9 at ICU admission to 85 at ICU discharge.</li> <li>• Mechanical ventilation days in the routine care and mobility groups were 3.3 and 3.8 days, respectively. However, patients in the mobility group got out of bed on 2.5 more days than patients in the routine care group</li> </ul>
Ju <i>et al.</i> , (2017) China	To establish scientific, practical, evidence-based nursing-sensitive quality indicators for emergency nursing.	Systematic literature review to establish and select evidence-based indicators followed by an expert Delphi panel to reach a consensus on the indicators	<ul style="list-style-type: none"> <li>• Patients' satisfaction with emergency nursing service</li> <li>• Rate of prompt provision of painkillers to patients with severe pain</li> <li>• Pain assessment rate</li> <li>• Pain reassessment rate in patients with moderate/severe pain</li> <li>• Rate of falls</li> <li>• Incidence of pressure ulcers</li> <li>• Rate of drug delivery errors</li> <li>• Time compliance rate for b2 receptor agonist and bronchodilator treatment in acute severe asthma patients</li> </ul>	Delphi panel of 40 experts included <ul style="list-style-type: none"> <li>• Chief nurse (n = 2)</li> <li>• associate chief nurse (n = 6)</li> <li>• nursing supervisor (n = 25)</li> <li>• chief physician (n = 2)</li> <li>• associate chief physician (n = 5)</li> </ul>	Final list: <ol style="list-style-type: none"> <li>1. Patients' satisfaction with emergency nursing service</li> <li>2. Rate of prompt provision of painkillers to patients with severe pain</li> <li>3. Pain assessment rate</li> <li>4. Pain reassessment rate in patients with moderate/severe pain</li> <li>5. Rate of falls</li> <li>6. Accident incidence</li> <li>7. Incidence of pressure ulcers</li> <li>8. Rate of drug delivery errors</li> <li>9. Eligible triage rate</li> </ol>

## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>• Percentage of patients with severe infection or infectious shock who receive broad-spectrum antibiotics within 1 hr after a definite diagnosis</li> <li>• BLS/ACLS certification rate</li> <li>• Critical value immediate reporting rate</li> <li>• Green channel: emergency care–ICU time compliance rate</li> <li>• Triage target response time attainment rate</li> <li>• First aid medication compliance rate</li> </ul>		<p>10. Bloodstream infection rate following emergency insertion of central venous catheter</p> <p>11. Rate of EKG examination within 10 min. after arrival of acute myocardial infarction patients</p> <p>12. The thrombolysis/PCI rate of acute myocardial infarction patient</p> <p>13. PCI treatment rate within 90 min. among patients requiring basic PCI treatment</p> <p>14. Thrombolysis treatment rate within 90 min. among myocardial infarction patients with ST-segment elevation verified by a first EKG</p> <p>15. Time compliance rate for b2 receptor agonist and bronchodilator treatment in acute severe asthma patients</p> <p>16. Rate of CT examination within 40 min. after arrival at the ED for among patients who appear to have acute stroke</p> <p>17. Blood glucose test rate in the ED among patients with acute</p> <p>18. EKG record among patients with acute stroke</p> <p>19. Percentage of patients with severe infection or infectious shock who receive broad-</p>
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## Annexure B 2: Characteristics of articles found

					<p>spectrum antibiotics within 1 hr after a definite diagnosis</p> <p>20. Active bleeding time compliance rate from admission until disposition</p> <p>21. Time compliance rate for patients with head injuries from admission until CT scan</p> <p>22. BLS/ACLS certification rate</p> <p>23. Availability of first aid equipment</p> <p>24. Critical value immediate reporting rate</p> <p>25. Green channel: emergency care– operating room time compliance rate</p> <p>26. Green channel: emergency care–ICU time compliance rate</p>
Klompas <i>et al.</i> , (2014) USA	To assess the preventability of ventilator-associated events (VAE)	Multi centre quality improvement collaborative prospective study of VAE surveillance among 20 ICUs between November 2011 and May 2013. Nurses and respiratory therapists performed paired daily spontaneous awakening trials (SAT) and spontaneous breathing trials (SBT)	<ul style="list-style-type: none"> <li>• Ventilator days</li> <li>• SAT rates</li> <li>SBT rates</li> </ul>	<ul style="list-style-type: none"> <li>• Nurses</li> <li>• Respiratory therapists</li> </ul>	<p>5164 consecutive mechanical ventilations</p> <p>Frequencies of SATs, SBTs, and percentage of SBTs performed off sedatives increased</p> <p>SAT performance rates increased from 14% of days where indicated to 77% where indicated corresponding to increase from 5% of ventilator days to 21% of ventilator days</p> <p>SBT performance rates increased from 49 to 75% of ventilator days corresponding to 37% of ventilator days in the 1<sup>st</sup> month of</p>

## Annexure B 2: Characteristics of articles found

		and temporal trends in VAE measured			collaborative and 35% of ventilator days in the last month of collaborative Percentage of SBT performed with sedatives off increased from 6.1 to 87% of SBT Improvements in SAT and SBT performance rates were paralleled by significant decrease in VAE rates. Mean duration of mechanical ventilation dropped by 2.4 days Significant association between monthly unit SAT and SBT performance rates and length-of – stay, mortality and VAEs
Koch <i>et al.</i> , (2020) Switzerland	To determine indicators of nursing care performance by identifying structures, processes, and outcomes that are relevant, feasible, and have the potential for benchmarking in Swiss acute hospitals.	A modified Delphi technique consisting of a series of subsequent rounds using 3-point Likert scale, interrupted by controlled feedback (based on the information provided in the previous round), that seek to gain the most reliable consensus of opinion of a group of experts. Beginning the process with a set of carefully selected 19 indicator	<ul style="list-style-type: none"> <li>• Pressure ulcer (hospital acquired) Prevalence (%)</li> <li>• Falls</li> <li>• Nursing care hours per patient:</li> <li>• Composition of care teams: Levels of missed care (1RN/4 patients)</li> <li>• Nursing turn over</li> <li>• Use of restrains (vests and limbs)</li> <li>• Urinary infection from catheter use (hospital acquired)</li> <li>• Mortality (in hospital)</li> <li>• Length of hospital stay</li> <li>• Nursing interventions for promotion/prevention</li> </ul>	<ul style="list-style-type: none"> <li>• Clinical nurse specialist</li> <li>• Nursing management</li> <li>• Nursing research</li> </ul>	12 indicators were found to be relevant, feasible, and has high potential for benchmarking: <ul style="list-style-type: none"> <li>• Use of restrains (vests and limbs)</li> <li>• Quality of the working environment (assessed by the nurses)</li> <li>• Falls</li> <li>• Urinary infection from catheter use (hospital acquired)</li> <li>• Medication management errors</li> <li>• Nursing staff turnover</li> <li>• Nursing interventions for promotion/prevention</li> </ul>

## Annexure B 2: Characteristics of articles found

		items from Dubois et al. (2017)	<ul style="list-style-type: none"> <li>• Quality of the working environment (assessed by the nurses)</li> <li>• Medication management errors</li> <li>• Discharge planning (patient satisfaction)</li> <li>• Failure to rescue</li> <li>• Readmission, unplanned</li> <li>• 30-day death (mortality) rates</li> <li>• Patient satisfaction with nursing care</li> <li>• Number of continuous hours worked</li> </ul> <p>Functional status change</p>		<ul style="list-style-type: none"> <li>• Pressure ulcer prevention (hospital acquired)</li> <li>• Nursing care hours per patient</li> <li>• Discharge planning (patient satisfaction)</li> <li>• Failure to rescue</li> </ul>
Kouatly et al. 2018 Lebanon	To describe the relationship between nurse staffing and NSOs at a Magnet designated, university hospital in a low-income country.	A 48- month prospective study	<ul style="list-style-type: none"> <li>• Patient falls:</li> <li>• Injury falls:</li> <li>• HAPI: Hospital acquired pressure injuries</li> <li>• CAUTI: catheter-associated urinary tract infections</li> </ul>		<ul style="list-style-type: none"> <li>• Patient falls: defined as the rate per 1,000 patient days at which patients experience an unplanned descent to the floor;</li> <li>• Injury falls: defined as the rate per 1,000 patient days that resulted in an injury;</li> <li>• HAPI: defined as the total number of patients with any stage of pressure ulcer on the day of the prevalence study (excluding patients admitted with a pressure ulcer);</li> <li>• CAUTI: defined as the rate per 1,000 patient days at which patients experience an infection related to a catheter;</li> </ul>

## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>VAP: ventilator associated pneumonia</li> <li>CLABSI: central line blood stream infections</li> </ul>		<ul style="list-style-type: none"> <li>VAP: defined as the rate of infection related to 1,000 patient days on a ventilator; CLABSI: defined as any infection per 1,000 patient days related to a central line.</li> </ul>
Mullin <i>et al.</i> , (2017) USA	To implement and describe a multifaceted intervention to decrease CAUTIs in ICUs with an emphasis on indications for obtaining a urine culture.	A prospective study comparing result pre and post implementation (2013 and 2014) among ICUs aligning routine culturing practice with American College of Critical Care Medicine (ACCCM) and Infectious Disease Society of America (IDSA) guidelines for evaluating a fever in a critically ill patient. Surveillance data for CAUTI and hospital-acquired bloodstream infection (HABSI) were recorded prospectively according to National Healthcare Safety Network (NHSN) protocols. Device utilization ratios (DURs), rates of	<ul style="list-style-type: none"> <li>CAUTI rate</li> <li>Device utilization rate</li> <li>HABSI</li> </ul>	Representatives from all intensive care unit (ICU) disciplines (i.e., paediatric, medical, surgical, neurologic, cardiac, heart failure, and cardiothoracic surgery) and infection prevention (IP)	<p>There were 11,117 ICU admissions in 2013, resulting in 74,705 patient days; there were 11,589 admissions in 2014, resulting in 75,569 patient days. The DURs were 0.7 in 2013 and 0.68 in 2014. The number of urine specimens cultured decreased from 4,749 in 2013 to 2,479 in 2014. The CAUTI rate decreased from 3.0 per 1,000 catheter days in 2013 to 1.9 in 2014 (<math>P = .0003</math>; rate ratio, 0.6291; 95% confidence interval [CI], 0.49–0.81).</p> <p>The HABSI rates per 1,000 patient days decreased from 2.8 in 2013 to 2.4 in 2014 (<math>P = .15</math>). The rates of HABSI secondary to Enterobacteriaceae per 1,000 patient days decreased from 0.71 in 2013 to 0.66 in 2014 (<math>P = .72</math>; rate ratio, 1.1; 95% CI, 0.73–1.60).</p> <p>Conclusion: emphasized “stewardship of testing” by following published guidance for evaluation of a fever prior to</p>

## Annexure B 2: Characteristics of articles found

		CAUTI, HABS, and urine cultures were calculated and compared.			ordering a urine culture in a critically ill patient.
Myers <i>et al.</i> , (2018) Australia	To identify suitable indicators for measuring the impact of nurse staffing and nurse skill mix variations on patient outcomes in stand-alone high acuity areas.	A systematic review based on Population, Intervention, Comparator, Outcome, Study Design (PICOS)	<ul style="list-style-type: none"> <li>• Mortality,</li> <li>• Length of stay,</li> <li>• Central-line-associated bloodstream infection,</li> <li>• Ventilator-associated pneumonia,</li> <li>• Sepsis,</li> <li>• Falls with injury,</li> <li>• reintubation,</li> <li>• Medication errors.</li> </ul>	adult patients in stand-alone high acuity areas such as coronary care, intensive care, high dependency units,	<p>Mortality was the most commonly tested indicator with 13 studies reporting a significant association with nurse staffing, and six reporting no association.</p> <p>A range of infections in the majority of studies, were significantly associated with nurse staffing variables. Pneumonia, sepsis and pathogen presence were also found to have a significant association with staffing variables</p> <p>In a number of studies, the evidence supporting an association between nurse staffing and falls was stronger than that for pressure injuries.</p> <p>length of stay including hospital length of stay as and ICU length of stay, was significantly associated with nurse staffing in half of the studies that included this outcome</p> <p>Medication errors and reintubation were significantly</p>



## Annexure B 2: Characteristics of articles found

					associated with nurse staffing in most studies that assessed these outcomes
Noome <i>et al.</i> , (2016) The Netherlands	To gain insight into the roles and tasks of ICU nurses during end-of-life care (EOLC) in the ICU	An integrative review of 3 electronic databases Pubmed, CINAHL and EMBASE	<ul style="list-style-type: none"> <li>Care for ICU patient</li> <li>Care for the family</li> <li>Environmental aspects of EoLC</li> <li>Organisational aspects of EOLC</li> </ul>	Adult ICU ICU nurses	<ul style="list-style-type: none"> <li>Providing optimal pain and symptom management for the comfort of the patient is regarded as an important nursing intervention</li> <li>Pain and symptom management is described in most studies solely as administering analgesics and sedatives</li> <li>Gap exists between the theoretical models and actual care provided by ICU nurses during EOLC</li> </ul>
Nowicki <i>et al.</i> , (2017) Australia	To report hospital acquired pressure injury (PI) incidence in intensive care and non-intensive care patients, and to assess the clinical characteristics and outcomes of ICU patients reported as having a hospital acquired PI to better	The setting for this study was a 630 bed, government funded, tertiary referral teaching hospital. A secondary data analysis was undertaken on all patients with a recorded PI on the hospital's critical incident reporting systems and admitted patient data collection from July 2006 to March 2015.	A PI is a localised injury to skin and soft tissues usually over a bony prominence due to pressure, friction or sheer forces or a combination of these. It is measured as number of PI per 100 or 1000 patient separations (discharged, died, transferred or statistically separated) from any hospital permitted to admit patients, including public psychiatric hospitals	Quality effectiveness support team and the podiatry team	<p>Total of 5280 HAPI reports in 3860 patients, which consisted of 726 ICU reports and 4554 non-ICU reports.</p> <p>Both HAPI incident reports and patients with HAPI have increased over time</p> <p>In the ICU, there was an overall increase in HAPI of 2.9/100 separations from 2007 (4.6 per 100 separations) to 2015 (7.5 per 100 separations)</p> <p>In the hospital, there was a mean decrease in PI of 2.1/1000 from 5.8/1000 separations in 2007 to 3.7/1000 separations in 2015.</p>

## Annexure B 2: Characteristics of articles found

	understand patient factors associated with their development in comparison to ward patients				During the study period, hospital activity increased from 24281 separations with an average length of stay of 6.4 days in 2007 to 50101 separations with an average length of stay of 3.5 days in 2015. Overall, the incidence of HAPI using the QHAPDC was 4.5/100 separations in ICU patients and 4.1/1000 separations in non-ICU patients. Incident reports limited to ICU patients with PI not present on admission have increased over time
Oner <i>et al.</i> (2021) USA	To provide a systematic review of the literature from 1997 to 2017 on nursing-sensitive indicators. To present a comprehensive perspective over the last 20 years,	Systematic review using a qualitative design with a deductive approach and mapping the relationships among all dependent and independent variables in the reviewed studies.	<ul style="list-style-type: none"> <li>• Urinary tract infection</li> <li>• Pneumonia</li> <li>• Wound infection</li> <li>• Hospital acquired sepsis</li> <li>• Postoperative/post treatment infections</li> <li>• Respiratory tract infections</li> </ul>		
Rajamani <i>et al.</i> , (2020) Australia	Evaluate PPE preparedness in Asia-Pacific ICUs with reference to WHO	A cross-sectional web-based survey conducted between March and May 2020 in ICUs in Asia Pacific countries	<ul style="list-style-type: none"> <li>• PPE preparedness</li> <li>• Level of PPE stock</li> </ul>	Intensivists	633 ICU <u>Training</u> Training of endotracheal intubation reported in 35% of ICU (range: 18 – 79%)

## Annexure B 2: Characteristics of articles found

	recommendations				<p>Special intubation teams with senior anaesthetist/intensivist used in 66% of ICU (range: 33 – 93%)</p> <p>Training in donning and doffing regularly provided in 60% of ICU (range: 42 – 100%)</p> <p>Intrahospital transport provided in 20% of ICU (range: 8-50%)</p> <p>Waste disposal training provided in 39% of ICUs (range: 33-56%)</p> <p><u>Choice of PPE</u></p> <p>N95/P2 masks used for AGP only (38% of ICUs)</p> <p>N95/P2 masks used routinely irrespective of AGP (59% of ICUs)</p> <p>Use of personal air purifying respirators in 6% of ICUs</p> <p>Use of full body suits (35%; range: 0 – 94%)</p> <p>Use of head covers/caps – 71%</p> <p>Use of shoe covers – 45%</p> <p>Use of neck covers – 37%</p> <p>Use of hospital scrubs – 58%</p> <p>Routine showering/shampooing of hair after shifts – 60%</p> <p>Routine showering/shampooing of hair after PPE breach – 15%</p> <p>N95/P2 mask fit testing – 27%</p> <p>Mandatory observer monitoring of donning/doffing (“buddy system”) – 37% of ICUs</p>
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## Annexure B 2: Characteristics of articles found

					<u>Disposal of patients with Covid-19 in ICU</u> Managed in negative pressure room – 37% of ICU Avoidance of high-flow nasal oxygenation – 68% Others Adequate PPE stock – 52% Visitation rights – prohibited in 66%; unchanged in 28%
Saint <i>et al.</i> , (2016) USA	To reduce catheter associated UTIs and improve attitudes and behaviour with respect to safety	Assessment of sustainability by dissemination of information to hospitals followed by data collection and guidance on key technical and socio-adaptive factors in the prevention of catheter associated UTI. Data collected on catheter use and CAUTI rates during 3 phases: at baseline, during implementation, and during sustainability. Multilevel binomial models were then used to assess	<ul style="list-style-type: none"> <li>• Catheter use: defined as the proportion of patients with indwelling urinary catheters monitored as a process measure and calculated as the number of catheter-days divided by the number of patient days and multiplied by 100</li> <li>• Catheter associated urinary tract infection rates: defined as the number of CAUTIs divided by 1000 catheter days</li> </ul>	<ul style="list-style-type: none"> <li>• ICU</li> <li>• Non-ICU</li> </ul>	926 units in 603 hospitals in 32 states evaluable 59.7 were non-ICU and 40.3 were ICU located ICU were more likely to be located in teaching hospital than in rural or critical access hospitals <u>CAUTI rates</u> Un-adjusted CAUTI rates decreased by 22.3% from 2.82 infections per 1000 catheter-days at the end of base-line to 2.19 per 1000 catheter-days at the end of sustainability period In adjusted analysis catheter days decreased from 2.40 infections per 1000 catheter-days at end of base-line to 2.05 per 1000 catheter-days at the end of sustainability period (IRR 0.86; 95% CI, 0.76-0.96; p=0.009)

## Annexure B 2: Characteristics of articles found

		changes in catheter use and CAUTI rates.			<p>Most reduction seen in non-ICU: from 2.28 to 1.54 (IRR 0.68; 95% CI, 0.66 to 0.82; <math>p&lt;0.001</math>)</p> <p>Less reduction seen in ICUs: from 2.48 to 2.50 (IRR 1.01; 95% CI, 0.87 to 1.17; <math>p=0.90</math>)</p> <p><u>Catheter use</u></p> <p>Unadjusted catheter use decreased from 19.8% to 18.2% in non-ICU and from 61.1% to 57.6% in ICUs</p> <ul style="list-style-type: none"> <li>Adjusted catheter use decreased from 20.1% to 18.8% in non-ICU (IRR 0.93; 95% CI, 0.90 to 0.96; <math>p&lt;0.001</math>) but did not change in ICU (from 62.8% to 61.9% [IRR 0.98; CI 0.96 to 1.01; <math>p=0.15</math>])</li> </ul>
Sampathkumar <i>et al.</i> , (2016) USA	To identify a bundle of interventions to reduce CAUTI	Piloting of a bundle consisting of 6 easy to remember elements, the “6 Cs” of CAUTI reduction, namely: <b>consider</b> alternatives to daily indwelling catheter; <b>connect</b> with a securement device; keep it <b>clean</b> ; keep it <b>closed</b> ; <b>call</b> for bladder scan before irrigating; <b>culture</b> urine only when indication is clear	<ul style="list-style-type: none"> <li>CAUTI rates per 1000 catheter-days</li> <li>Standardised infection ratio (SIR) defined as the ratio of actual cases compared to what would be expected for that setting</li> </ul>	<ul style="list-style-type: none"> <li>Infection prevention and control</li> <li>Hospitalist</li> <li>Patient care nurse</li> <li>Urology technician advisor</li> <li>Nurse educator</li> <li>Nurse manager and supervisor</li> </ul>	<ul style="list-style-type: none"> <li>CAUTI rates decreased by 70% from the 2013 baseline of 2.0/1000 catheter-days to 0.6/1000 catheter-days in 2015</li> <li>SIR for CAUTI in ICU reduced from 1.0 in 2013 and 2014 to 0.25 in 2015</li> </ul>

## Annexure B 2: Characteristics of articles found

				<ul style="list-style-type: none"> <li>Healthcare system engineer Administrators</li> </ul>	
Stifter <i>et al.</i> , (2021) USA	To share the investigators' first-round experience in caring for critically ill COVID-19 patients	A description of the work and outcomes of institutional staff-driven PI teams utilizing the Plan-Do-Study-Act approach to quality improvement.	<ul style="list-style-type: none"> <li>Central line–associated bloodstream infection</li> <li>Hospital-acquired pressure injuries</li> <li>CLABSI case reviews</li> <li>Prone-positioning team</li> <li>Wound ostomy</li> <li>Continence care nurse rounds</li> <li>Catheter-associated urinary tract infections rates</li> <li>Falls and falls with injury</li> <li>A new standard for catheter care</li> <li>pressure ulcers</li> <li>patient satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>Registered nurses</li> <li>Frontline practitioners</li> <li>Specialty nurses, infection control nurses</li> <li>Clinical nurse specialists</li> <li>Unit leadership</li> <li>PI staff</li> </ul>	<p>The following innovative plans were implemented in response to the influx of critical care patients and to optimize resources:</p> <ul style="list-style-type: none"> <li>prone positioning,</li> <li>placement of IV pumps outside of the patient rooms</li> <li>iPads to facilitate virtual communication</li> <li>redeployment of RNs as respiratory therapist extenders to assist with non-ventilated patients</li> <li>acute care nurses were redeployed to work in the ICU environment led by an ICU RN</li> </ul>
Sutton & Jarden, (2017) New Zealand	To describe a nurse-initiated quality improvement (QI) project that improved the care of critically ill patients in a New Zealand tertiary ICU	Developing the indicators and initiating intervention then recording outcomes and giving feedback	<ul style="list-style-type: none"> <li>Early enteral nutrition within 24 hours of admission</li> <li>Timely antibiotics within an hour of admission</li> <li>Daily mobilization</li> <li>Daily sedation interruption</li> <li>3 hourly repositioning</li> <li>Daily mobilization</li> </ul>	<ul style="list-style-type: none"> <li>Senior nursing team responsible for infection control and health and safety.</li> <li>Frontline nurse representatives</li> </ul>	<p>Compared outcome data for 2 consecutive time periods: 2014 and 2015</p> <ul style="list-style-type: none"> <li>All eligible patients have enteral nutrition commenced within the first 24 h of ICU admission (3% increase);</li> <li>All eligible patients receive antibiotics within 30 min of prescription time (6% increase);</li> <li>All eligible patients have a DSI (24% increase);</li> </ul>

## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>• Endotracheal tubes repositioned and retied every 12 hours</li> <li>• Nasogastric tubes repositioned and retied and every 12 hours</li> <li>• Contextual factors such as ICU patient flow and acuity and nursing staffing levels</li> </ul>	<ul style="list-style-type: none"> <li>• Interprofessional decision makers</li> <li>• QI approval team</li> <li>• Resource acquisition team</li> </ul>	<ul style="list-style-type: none"> <li>• All eligible patients are mobilized early, between day 0 and 3 of their ICU stay (79% of patients in 2014 and 53% in 2015)</li> <li>• All eligible patients are mobilized daily in their ICU stay (11% increase in percentage of patients mobilized daily).</li> </ul> <p>Variable quarterly and annual improvement in relation to the three remaining standards (the three pressure ulcer prevention strategies)</p>
Tabah <i>et al.</i> , (2020) Australia	To describe the current reported practice, availability, training, confidence in use and adverse effects due to extended use of PPE by HCW from around the world caring for covid-19 patients who require ICU management	A web-based survey in order to elicit HCW reports surrounding PPE related to covid-19 pandemic. HCW involved with care of patients in critical care setting over 2 weeks from March 30 2020.	<ul style="list-style-type: none"> <li>• Availability of PPE</li> <li>• Adequacy of training</li> <li>• Adverse effects</li> <li>• Usage of PPE</li> </ul>	<ul style="list-style-type: none"> <li>• Physicians (n=1797; 67%)</li> <li>• Nurses (n=744; 27%)</li> <li>• Allied (n=170; 6%)</li> </ul>	<p>Most had formal training in use of PPE</p> <p>2-person technique for doffing and donning – 26%</p> <p>Confidence with technic of using available PPE – 45%</p> <p>PPE-shift – 4 hours</p> <p>Adverse effect – 80% (heat [51%]; thirst [47%]; pressure areas [44%]; headaches [28%]; inability to use bathroom [27%]; and extreme exhaustion [20%])</p>
Theeranut et al. 2019 Thailand	To examine the validity of the	Prospective descriptive study conducted in the ICUs	Pressure ulcer: incidence (%)	<ul style="list-style-type: none"> <li>• Patients admitted to ICU</li> </ul>	288 cases studied, of which 32 patients developed PUs Median APACHE II score was 18

## Annexure B 2: Characteristics of articles found

	<p>Braden scale in the ICU setting -off points.</p> <p>To demonstrate the performance of each tool at the optimal cut</p>	<p>of a tertiary care hospital from January to April 2019 by comparing the overall performance of the Braden scale in predicting the development of PUs in ICU patients with those of three risk assessment scales that have proven to be effective in the ICUs: the Braden (ALB) scale, the COMHON Index, and CALCULATE.</p>		<ul style="list-style-type: none"> <li>Nurse</li> </ul>	<p>Majority of patients (52.8%) were admitted to the ICU because of organ failure (52.8%), and the median length of stay was 5 days. PU risk scores in predicting PU risk was fair with any of the three scales.</p> <p>The overall performance of the COMHON Index and Braden scale was poor. The optimal cut-off point for the Braden (ALB) scale was 13, resulting in a sensitivity of 65.62% and specificity of 73.04%. At a cut-off point of 3, the seven-item CALCULATE had a sensitivity of 68.75% and specificity 68.75%. The optimal cut-off point for the Braden scale was 12, with a sensitivity of 50% and specificity of 80.15%. A cut-off point of 14 for the COMHON Index yielded a sensitivity and specificity of 37.5% and 83.98%, respectively.</p>
Yang <i>et al.</i> (2018) China.	<p>To utilize the Delphi method to develop reliable indicators for the quality of ICU nursing care across China</p>	<p>Comprehensive literature search to identify relevant articles from which QIs were extracted. QIs were then presented to expert teams in 2 Delphi rounds to obtain consensus.</p>	<ul style="list-style-type: none"> <li>Implementation rate of standard enteral nutrition management</li> <li>Incidence of ventilator-related pneumonia (VAP)</li> <li>Incidence of intravascular catheter-related infection (IVCI)</li> </ul>	<ul style="list-style-type: none"> <li>Nurse managers</li> <li>Nurse specialists</li> </ul>	<ul style="list-style-type: none"> <li>VAP: Number of patients who had ventilator-related pneumonia ÷ Total days of patients using the ventilator</li> <li>IVCI: Number of ICU patients who had intravascular catheter related infection ÷ Total days of ICU patients using the central venous catheter</li> </ul>



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		<p>Consensus was determined by analysing degree of authority (Cr) based on the educational level of the expert and the basis for judgment (experience, theoretical analysis, reference to data at home and abroad, and intuitive feelings) (Ca), and the degree of the expert's familiarity with the questions (Cs) such that: <math>Cr = (Ca + Cs)/2</math></p>	<ul style="list-style-type: none"> <li>• Incidence of urinary catheter-related urinary tract infection</li> <li>• Incidence of pressure ulcer (PU)</li> <li>• Ratio of reaching the standard in the management of the blood glucose level</li> <li>• Implementation of early and appropriate broad-spectrum antibiotics within 1 hr after definite diagnosis</li> <li>• Implementation rate of hand hygiene</li> <li>• Rate of ICU staff who had completed advanced cardiac life support training</li> <li>• Rate of using restraints</li> <li>• Incidence of outgoing transport-related accident</li> <li>• Rate of evaluation for sedation</li> <li>• Rate of evaluation for analgesia</li> <li>• Rate of evaluation for delirium</li> </ul>	<ul style="list-style-type: none"> <li>• PU: Number of patients who had pressure ulcer during the period of research ÷ Number of ICU patients' total hospitalization days (Patients who had "pressure ulcer" before being admitted to the ICU were excluded from the numerator and denominator).</li> <li>• Number of patients who had a serious infection or septic shock and were treated with broad spectrum antibiotics within 1 hr after definite diagnosis ÷ Number of patients who had a serious infection or septic shock) × 100%</li> <li>• (Number of days using restraints ÷ Number of ICU patients' total hospitalization days) × 100</li> <li>• Number of patients who underwent evaluation for sedation ÷ Number of ICU patients who took sedative drugs) × 100</li> <li>• Number of patients who underwent evaluation for delirium ÷ Number of patients in the ICU) × 100</li> <li>• Number of nurses who had worked in the ICU for more</li> </ul>
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## Annexure B 2: Characteristics of articles found

			<ul style="list-style-type: none"> <li>Percentage of nurses who had worked in the ICU for more than 3 years</li> <li>Ratio of reaching the standard in the management of the blood glucose level</li> <li>Ratio of deep vein thrombosis</li> <li>Incidence of incontinence-associated dermatitis</li> <li>incidence of unplanned extubation following endotracheal intubation in the ICU</li> <li>Incidence of outgoing transport-related accidents</li> </ul>		<p>than 3 years ÷ Number of registered ICU nurses at the same period) ×100</p> <ul style="list-style-type: none"> <li>(Total number of time with blood glucose level reaching 8–10 mmol/L ÷ Total number of blood glucose measurements performed for critically ill patients) × 100</li> <li>(Number of patients who received DVT prevention ÷ Number of patients in the ICU) ×100</li> <li>Incidence (‰) = (Number of patients who had incontinence-associated dermatitis ÷ Number of ICU patients' total days of hospitalization) ×1000</li> <li>Incidence (‰) = (Number of cases of unplanned extubation following endotracheal intubation ÷ Total duration of endotracheal intubation [Days]) ×1000</li> </ul> <p>Incidence (‰) = (Number of cases with outgoing transport-related accidents ÷ Number of transported patients) ×1000</p>
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