**Supplementary data A: Refinement of guideline after Round 1**

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| **Original nursing guideline statement** | **Comments from experts** | | **Refined nursing guideline statement** |
| **Nursing guideline statement 1: Assessing for intra-abdominal hypertension/abdominal compartment syndrome** | | | |
| **Measure intra-abdominal pressures when any known risk factors for intra-abdominal hypertension/abdominal compartment syndrome is present in a critically ill or injured patient. It is important to recognize that the patient with an “open” abdomen and temporary abdominal closure dressing are still at risk for developing intra-abdominal hypertension/abdominal compartment syndrome and provide ongoing assessment for the organ system manifestations of intra-abdominal hypertension/abdominal compartment syndrome.** | * Should be assessed in all patients with open abdomens. * It's a simple bedside skill that can have far reaching benefits with regards to preventing the complications of a compartment syndrome * Would add "using approved devices" after the first 4 words of the statement. * Tools should be explained clearly as well as which one is to be used as various measuring equipment is available to be used, but not always used accurately. * It should be done every 8 hours. * It informs fluid resuscitation from insensible losses from open abdomen. Renal perfusion, intestinal perfusion. * Include "post abdominal surgery?" * In my current workplace we see open abdomens a few times a year, however the frequent measuring of intra-abdominal pressure is not common practice, and the equipment is not readily available. * I assume this is invasive monitoring, is it important to note that there is a non-invasive component as well? * Before measuring it is important to assess the any signs of abdominal distension in all the patients who are having an open abdomen. Ensure that the patient is connected to negative therapy Then measure the intra- abdominal pressure strictly 4 hourly and record. | | Measure intra-abdominal pressures when any known risk factors for intra-abdominal hypertension/abdominal compartment syndrome is present in a critically ill or injured patient, using invasive or non-invasive methods (depending on availability). Note: It is important to recognize that the patient with an “open” abdomen and temporary abdominal closure dressing are still at risk for developing intra-abdominal hypertension/abdominal compartment syndrome and provide ongoing assessment for the organ system manifestations of intra-abdominal hypertension/abdominal compartment syndrome |
| **Accompanying nursing interventions** | | | |
| **Original nursing intervention** | **Comments from panel of experts** | | **Refined nursing intervention** |
| **1.1 Nursing interventions on assessing for intra-abdominal hypertension/abdominal compartment syndrome.** | | | |
| **1.1a) Initiate intra-abdominal pressure measurements as ordered.** | * By measurement of the intra-abdominal pressures, you will be able to recognise changes early and intervene. * Stock is not always available. * During orientation of staff to the unit- symptoms should be highlighted of signs and symptoms for abdominal compartment syndrome. Evaluation of patient per shift should be required particularly to Compartment syndrome signs and symptoms. * It is critical to ensure that all consumables are available to execute the intervention and that all nursing staff are well versed on how to execute the intervention - regular in-service training will be of value in this regard. * There are hardly sets available to do the measurements. * Sets for intra-abdominal monitoring not readily available in all settings. * Invasive monitoring needs to be requested by a medical physician, but non-invasive monitoring can be initiated by nursing staff. Patient advocacy and evidence-based suggestions by nursing staff as part MDT discussion is vital. * Specific monitoring equipment and doctor preference will impact on the practical implementation of the guidelines in private sector facilities. * Not practical in a government setting which is resource and staff limited. Otherwise, feasible. * Practicality depends on availability of equipment. * Due to equipment not being regularly available, such as indwelling catheter measurements, accurate measurements do not get done.   In a resource poor environment without proper measuring equipment, this is not feasible and accurate. | | 1.1a) Initiate intra-abdominal pressure measurements in a patient with suspected intra-abdominal hypertension or abdominal compartment syndrome. |
| **1.1b) Implement, monitor, and record intra-abdominal pressures.** | * It can be somewhat impractical because of the labour and time required to set up. I addition, lack of resources in our setting might mean it is not always easy to secure the equipment. * As above -training and consumable availability are critical in this regard. * Once recorded, immediate intervention to decompress the abdomen can be started. * No stock available * As short staffing becomes a bigger problem more and more, nurses experience severe increases in workload and therefor quality of nursing is affected. If a patient is severely ill, management of acute life-threatening issues such as mixing inotropes et. are prioritised over ‘paperwork’. * Specific monitoring equipment and doctor preference will impact on the practical implementation of the guidelines in private sector facilities. * Practicality depends on availability of equipment. * Due to equipment not being regularly available, such as indwelling catheter measurements, accurate measurements do not get done.   Proper recording/monitoring can detect worsening/or improvement in intra-abdominal pressure and consequently guide the necessary interventions | | 1.1b) Implement, monitor, and record intra-abdominal pressures, 4 to 8 hourly**.** |
| **1.1c) Calculate and record abdominal perfusion pressure (APP): APP = MAP-IAP.** | * When the APP decreases there is a high risk of intra-abdominal organ complications. Every Nurse should be skilled in measuring IAP. Can be implemented with charting. * Can be time-consuming especially when staff have many pieces of information to record. * Availability of the formula visually and orientation of staff- especially agency staff * No sets available. Depends on availability of equipment to measure IAP. * If all valuables are available, calculating abdominal pressure is easily done. | | 1.1c) Calculate and record abdominal perfusion pressure (APP): APP = MAP-IAP, using invasive or non-invasive methods, depending on device availability. |
| **1.1d) Consider developing a nurse-driven protocol.** | * Protocols are helpful in assisting and supporting the nurses for conformance and consistency. * It's very important to have standardised protocols that staff can easily follow to ensure uniform management and make management itself easier. The difficulty lies is spreading the information and ensuring that everybody is aware of it and practicing it. * Implementation depends on institutional autonomy. * Nurses are the MOST important clinical observers of pts clinical changes. * A nurse driven protocol is an excellent idea -this will potentially decrease the number of patients with significant risk factors for ACS that are missed or diagnosed late. * The timing of measurement, charting, patient choice, * Big need for this to create a safe framework for CC nurses to practice in. * Nurses today seems to fear doing what they know without the permission of the doctors. * Nurse led protocols assist in creating policies that are not only evidence based but also include the capability and resource availability of the unit that implement the policy. * This can be tailored to the needs of a particular facility, to aid in continued reliable measurements/monitoring. * A protocol is important because it creates a standard and continuity in nursing care and from patient to patient. Concerns from nurses’ side can be raised and action plans be implemented. | | 1.1d) No refinement required |
| **1.2 Nursing interventions to decrease intra-abdominal pressure (IAP).** | | | |
| **1.2 a) Ensure that gastric/ intestinal tubes are patent and functioning as ordered** | * If drainage bags are not functional the abdomen will be distended. * This is reasonable with certain tubes, such as nasogastric tubes. However, it can be impractical when it comes to more complex tubes, such as feeding jejunostomies. In such patients who have had complex surgery, the assessment of the tubes should fall with the managing surgeons.   Gastric tubes need to be patent otherwise the intra-abdominal pressure increases and without monitoring patient’s condition deteriorates.   * Include statement on how to ensure patency? * Line patency is crucial if deflation is required. Tubes can become blocked if not regularly assessed. | | 1.2a) No refinement required |
| **1.2 b) Use evidence-based methods to identify tube location. Two or more methods are recommended. Observe for respiratory distress. If available, use capnography and use pH strips to measure pH of aspirate. Examine the visual appearance of tube aspirate. Review radiographic reports for confirmation of blind-inserted nasogastric tube.** | * Confirm NG tube position by radiograph. The Litmus can still give false info. * The nurses in our ICU have several duties and it can be tiresome to expect them to test the pH of gastric fluid routinely. In my experience, confirmation of tube placement lies with the doctor. * PH strips can be used to measure the PH aspirate and chest X-rays can be used to verify the actual positions of either nasogastric tubes or orogastric tubes. * In the context where I work neither pH indicators nor capnography is not available. We rely on auscultation, should this technique be included? Not sure since. * Should be recorded and confirmed with medical staff where possible. * Nasogastric tube placement should always be confirmed with radiography. I have my concerns to how practical and available the use of capnography would be in this regard. * Time and resources can be big limitations… what about a grading system for EBP methods to check tube location. * In a resource and staff limited government hospital, not practical. Otherwise, feasible. * Tube placement confirmation is crucial in some critical patients. Ngt placement Not checked radiographic by all units. * Proper/precise placement of measuring device with ensure reprocible results. * Both capnography and pH strips are not always readily available. Radiographic review most accurate. * The medico-legal standard is to not test pH but to review the X-ray. Two methods are not required. | | 1.2 b) Use evidence-based methods to identify tube location. Latest evidence suggests taking an abdominal x-ray to identify the tube location. Examine the visual appearance of tube aspirate and tube auscultation can also be done. |
| **1.2 c) Prevent constipation, by ensuring adequate nutrition and hydration.** | * With an open abdomen often enteral nutrition is withheld depending on the surgery performed. * Nutrition and hydration are important aspects of nursing and can entail something as straightforward as a fluid bolus. Feeding can be more laborious, especially when it comes to equipment. * Dieticians to assist with the prescription of the correct diet for ICU patients to prevent constipation and diarrhoea. * Staff should be made aware of the importance of bowel movement recording and reporting of no bowel movement. * Critical patients are left without nutrition for extended periods, but TPN can be considered. * Patient’s clinical pictures do not always allow for implementation of proposed medical treatment plan. * All should be on board as rest of mdt not always open to suggestions or comments. * Nutrition can he overlooked for multiple days is critically ill patients. Establishing a feeding plan, enteral or parenteral with the aid of a dietitian can ensure optimal nutrition is present for healing as well as malnutrition. prevention/correction. * intravenous access can offer an alternative way of feeding to meet daily energy demands if the enteral route is contra-indicated. | | 1.2 c) Prevent constipation, ensure gut motility, and prevent the development of a paralytic ileus, by ensuring adequate nutrition and hydration. |
| **1.2 d) If the patient is constipated, advocate for a laxative and stool softener.** | * Difficult to assess and auscultate an open abdomen to confirm constipation. * This entails suggesting and appears relatively straightforward. * Can use FASTHUGBID Mnemonic * laxatives yes for constipation to prevent the discomfort for patients, Stool softeners are useful if the bowel is active and functional. * Prevention of constipation through early intervention in mobility. * Nurses should be part of the doctors’ rounds AND mention this as part of advocating for the pt * It is very important that nursing staff advocate for this -doctors often overlook this. A discussion with the involved dietician also goes a long way -possibly fibre content of the enteral feeds could be adjusted, and enteral water flushes added if this is a problem. * Again, time and resource limits * this will be an important intervention provided there is no obstruction in the intestinal tract | | 1.2d) No refinement required |
| **1.2 e) Discuss with provider whether a rectal tube will assist with decompression.** | * Distension might also be due to the gas which can be relieved by flatus tube. * The discussion is important, especially if it will benefit the patient. Passing rectal tubes also appears to be routine practice in our ICU. * rectal tubes used mostly for patients with severe diarrhoea. * Patient choice is important, rectal tubes can cause erosion, anal fissure. * Nurses today are scared to voice their clinical viewpoint. * Rectal tubes may dislodge, or leak leading to surrounding skin damage if not addressed in a timely manner. As with all tubes pressure injury risk assessment is needed. Stool needs to be assessed for looseness as any larger formed stool piece can block the tube. * any measures to reduce the abdominal pressures even slightly can bring about some sort of relief/comfort in the part and the benefit of prevent further complications of an abdominal compartment syndrome. * Resource poor environments does not always have access to this and if so, sometimes wrong equipment is being used that lead to ineffectiveness | | 1.2 e) Discuss with the treating physician/surgeon whether a rectal tube will assist with decompression. |
| **1.2 f) Monitor and record bowel movements.** | * The stool is a sign of bowel activity. * To monitor bowel movements twice a day record and report. Not ONLY Recording- SHOULD inform dr and drs rounds * Done routinely with changing, turning the patient. * Identification of constipation or loose bowels can be done easily and appropriate management implemented in a timely manner. * Presence or absence of bowel sounds is of no consequence in modern ICU management for both feeding or open abdomen | | 1.2f) No refinement required |
| **1.2 g) Monitor accurate input and output.** | * Open abdomen, drainage on suction can be monitored though it is sometimes not very accurate, to be able to replace the losses. * This is a laborious intervention but vitally important. It can be difficult in terms of constant measuring and the calculations. * tells you the hydration status of the patient. * Keep record and act at the earliest to correct and prevent and complications is important. * Input/output monitoring is one of the most important and clinically relevant variables charted on an ICU chart. * It can be difficult to measure stools. * Ensure calculations for cumulative totals etc and drain totals are correct. * Fluid balance can assist in assessment of retention or excessive losses aiding the medical team with decision making. * This is feasible, particularly in patients with an indwelling urinary catheter. Tapering urine output (in the presence of an adequate fluid status) can alert to the possibility of worsening of the abdominal pressures and thus aid in early interventions. * Must include dialysis volumes | | 1.2g) No refinement required |
| **1.2 h) Ensure adequate hydration.** | * Fluid replacement very crucial to prevent dehydration. Consider insensible losses. * Hydration can be difficult in these patients especially when they tend to third-space their fluids. A fluid bolus might be more harmful than helpful. * 24 hrs intake and output give a clear indication of the hydration status. * Keep record of all intake and output. * Assessing vitals, fluid balance. * Again, Patient condition VS fluid balance aim. * Not to only follow dr instruction but to also advocate for the patient. * Advocating for fluid replacement in patients who are unable to eat/drink can prevent dehydration and AKI. | | 1.2h) No refinement required |
| **1.2 i) Administer medications as ordered (eg, stool softeners, laxatives, and prokinetic agents).** | * To promote gut motility. * dieticians order the probiotics, and the Doctors order the stool softeners and the nurses to give the prescribed treatment. * Depends on patient condition and staffing ratios. * If medication availability is not a problem * Using practical sense as to route of administration and a nonfunctional bowel can assist in not causing more harm with over treatment. | | 1.2 i) Administer medications as prescribed (eg, stool softeners, laxatives, and prokinetic agents). |
| **1.2 j) Administer enemas as ordered.** | * If indicated for and do proper assessment. * Enemas are sometimes of limited use in the ICU and sometimes do not yield the desired result. * if prescribed to be given * Nurses need to be skilled with longer nozel applicators so as to not damage to rectum. | | 1.2 j) Administer enemas as prescribed. |
| **1.2 k) Positioning: avoid high Fowler position, if possible. Allow for head of bead elevation of 30°.** | * Avoid kinkage of drainage tubes. * Positioning can usually be done easily thanks to the remote-controlled bed but can be more time-consuming when it comes to different types of positioning, e.g. nursing with the left/right side of the chest up. * most patients in ICU head end of the bed needs to be elevated 30-45 degrees high not exactly high fowlers. * Nursing staff with limited understanding of respiratory implications of increased IAP would find this difficult to understand. * improper positioning can falsely increase measurements of intra-abdominal pressures. | | 1.2 k) Positioning: avoid high Fowler position, if possible. Allow for head of bead elevation of 30°. |
| **1.2 l) Assessment of patient: Monitor surgical and drain sites for signs of infection, skin integrity surrounding the surgical site and surgical drain sites, the volume and appearance of surgical site and surgical drain output, and for the formation of enteroenteric fistulae.** | * For proper monitoring of healing, infection, and drainages. * This can be a routine part of a general check for the patient, as nurses do a top to bottom assessment. * daily assessment for both day and night staff to detect any signs of infection. * Nursing assessment for skin integrity, very important * Record keeping! and record that dr informed * All absolutely essential observations -as the nursing staff spend significantly more time with the individual patient than the doctors do,they are often the first to note abnormalities in any of the above variables. * How often do we want this to be done? Once a shift or hourly? * Frequent monitoring can aid in early identification of bleeding or perforation. * Alert the surgeon of any concerns | | 1.2 l) Assessment of patient: Continuous monitoring of surgical and drain sites for signs of infection, skin integrity surrounding the surgical site and surgical drain sites, the volume and appearance of surgical site and surgical drain output, and for the formation of enteroenteric fistulae**.** |
| **1.2 m) Management of the patient: Initiate measures to maintain skin integrity adjacent to surgical wound and drains, measures to maintain patency of drains, and measures to contain fistula drainage. Consider consult with wound care specialist. Ensure replacement of ongoing losses with appropriate fluids in collaboration with provider where indicated.** | * Wound care staff will advise on the type of dressings to be used and appropriate interventions. * This can be difficult especially when some equipment or dressings are not available. It is sometimes also hard to quantify losses when the tubes leak. * poor skin integrity leads to skin ulceration so important to prevent or reduce occurrence. * Fluid replacement with appropriate fluids and electrolyte monitoring goes hand in hand. * Essential part of holistic patient care. As mentioned above -the nursing staff are often first to note any abnormalities in this regard and they must feel empowered to discuss their concerns with the treating doctors and wound care sisters where necessary. * Wound care is not primarily roe of the bedside ICU nurse. Wound care expert and surgeon to intervene and guide. * Resource limitations * In a resource and staff limited government hospital, not practical. Otherwise, feasible. * Minimising wounds will assist in earlier healing of already established wounds. * Replacement of losses should be considered to be part of maintaining the hydration status | | 1.2 m) Management of the patient: Initiate measures to maintain skin integrity adjacent to surgical wound and drains, measures to maintain patency of drains, and measures to contain fistula drainage.  Consider consult with wound care specialist. Ensure replacement of ongoing losses with appropriate fluids as prescribed. |
| **Original nursing guideline statement** | **Comments from experts** | | **Refined nursing guideline statement** |
| **Nursing guideline statement 2: Optimizing regional perfusion and damage control** | | | |
| * 1. **Optimizing regional perfusion: Fluid balance**   **Use a protocol to try to avoid a positive cumulative fluid balance in critically ill or injured patients with or at risk of intra-abdominal hypertension/abdominal compartment syndrome after resuscitation has been completed and the inciting issues have been addressed. Note that a positive fluid balance may contribute to intra-abdominal hypertension and negatively affect the ability to achieve fascial closure.** | | * This is a difficult line to walk as these patients lose a lot of fluids through various mechanisms. By avoiding a positive balance, you also run the risk of negatively affecting organ perfusion. * Fluid balance monitoring is important if over hydrated doctors to reduce the total fluid maintenance. * Critical intervention - ideally the patients fluid balance targets should be discussed and decided upon each day on the ward rounds with the treating medical team. Judicious use of fluids -including minimising the volume of IV fluid medications are mixed in as well as the use of Lasix must be considered daily. * Not a nurse task!   Give sufficient fluid to ensure adequate intravascular volume without overloading. Use the ROSE (Malbrain et al WJS 2017) concept to determine the correct phase of fluid management. | Consider using ROSE (Resuscitation, Optimising, Stabilisation, Evacuation) concept to manage fluid balance and try to avoid a positive cumulative fluid balance in critically ill or injured patients with or at risk of intra-abdominal hypertension/abdominal compartment syndrome after resuscitation has been completed and the inciting issues have been addressed. Note that a positive fluid balance may contribute to intra-abdominal hypertension and negatively affect the ability to achieve fascial closure.  \*ROSE concept: R:Resuscitation; O:Optimization; S: Stabilisation; E: Evacuation (Malbrain, Van Regenmortel, Saugel, De Tavernier, Van Gaal, Joannes-Boyau et al., 2018:11) |
| **2.2 Optimizing regional perfusion: Damage control resuscitation.**  **a) Use an enhanced ratio of plasma/packed red blood cells for resuscitation of massive haemorrhage instead of low or no attention to plasma/packed red blood cell ratios.** | | * Replace what is needed. Inform clinician. * One must replace what was lost. Therefore, if there was massive haemorrhage, it is sensible to do fluid resuscitation with blood products. * Might be impractical due to availability of blood products. * All round knowledge what this entails is important. * International literature clearly shows that a 1:1:1 ratio of packed cells to plasma to platelets has an improved outcome in damage control resuscitation. * Transfusion guidelines/protocols not being followed where I work. * Surgeons often prescribe, not always evidence asked but based on how they were trained. * it's not a nurse task x3! * Communication with blood bank to assist in massive transfusion policies will benefit patient outcomes. * Blood products may not always be available during a resuscitation, there may have to be some sort of a compromise in using crystalloids in a haemodynamically unstable patient. * This only applies to the TRAUMA patient with an open abdomen from bleeding - it is not applicable to sepsis. Surviving Sepsis guidelines should be followed for abdominal sepsis as reason for the open abdomen. | a) Latest evidence suggests a 1:1:1 ratio of plasma/platelets/packed red blood cells for resuscitation of massive haemorrhage instead of crystalloid resuscitation in patients in need of a massive transfusion of blood products in collaboration with the treating doctor/surgeon.  b) When patient presents as septic, incorporate the latest sepsis guidelines (2023) in the ICU management of the patient with an open abdomen in collaboration with the treating doctor/surgeon.  c) No recommendation could be made regarding the use of diuretics, renal replacement therapy, and albumin to mobilize fluids in haemo-dynamically stable patients with intra-abdominal hypertension after resuscitation has been completed and the inciting issues have been addressed. It is suggested to manage according to patient specifation.  Note: If intra-abdominal pressure is more than 25 mm Hg and new organ dysfunction/failure is present, the patient’s intra-abdominal hypertension/abdominal compartment syndrome is refractory to medical management.  d) Use strategies such as negative pressure wound therapy with temporary abdominal closure devices on critically ill or injured patients with open abdomens.  e) Nurses should be familiar with systems used in their individual practice environments, allowing for regular in-service training. |
| **b) No recommendation could be made regarding the use of diuretics, renal replacement therapy, and albumin to mobilize fluids in haemodynamically stable patients with intra-abdominal hypertension after resuscitation has been completed and the inciting issues have been addressed. If intra-abdominal pressure is more than 25 mm Hg and new organ dysfunction/failure is present, the patient’s intra-abdominal hypertension/abdominal compartment syndrome is refractory to medical management.** | | * Proper patient assessment will guide individualised care. * As indicated in the above comment section -it is essential to use a balanced resuscitation strategy. * Will depend on individual patient response to treatment, doctor preferences. * Maybe just review the updated 2021 Surviving Sepsis statements as these views are evolving presently. |
| **c) Use strategies such as negative pressure wound therapy with temporary abdominal closure devices on critically ill or injured patients with open abdomens.** | | * This assist with wound drainage and keep the surrounding area dry. * This is relevant but not always practical or practiced often in our ICU. * negative suction good for wound closure reduces introduction of infection. * Open abdominal wound can be septic, NPWT would not be indicated. * This aids in creating a protective barrier around the organs while reducing fluid build-up in and around the abdomen. Less frequent dressing changes can also decrease risk of infection. * It is only practical if correct equipment is used and regularly revised by surgeons or primary care givers. * Know how npwt is applied, knowledge is key. |
| **d) Nurses should be familiar with systems used in their individual practice environments.** | | * This aids in creating a protective barrier around the organs while reducing fluid build-up in and around the abdomen. Less frequent dressing changes can also decrease risk of infection. * It is only practical if correct equipment is used and regularly revised by surgeons or primary care givers. * Know how npwt is applied, knowledge is key. * Continuous in-service training of the product use. * Doctors to involve nurses when connecting patients to negative suction. * Should be included in in-service training programs and in Curriculum- Critical care and Trauma. The surgical and AED and ward staff should also be included in this!!!! * working with what you have in your facility can result in improved outcomes in subsequent interventions, as skill gets better with repetition. * From experience, in-service training is needed to manage complicated open abdomens on vacuum systems etc. Training to be given on equipment such as wound manage system or vac systems from companies. |
| **Accompanying nursing interventions** | | | |
| **Original nursing intervention** | | **Comments from panel of experts** | **Refined nursing intervention** |
| **2.1 Nursing interventions for optimizing regional perfusion and fluid balance:** | | | |
| **2.1 a) Monitor intake and output.** | | * To determine losses. Losses can be calculated, and intake adjusted accordingly. * Proper monitoring and record all intake and output. Take appropriate action to correct this very important. this gives information as to the hydration status of the patients. * ward staff should be made aware. * Limitations on stool measurement | 2.1 a) Monitor intake and output. Take in consideration the insensible losses. |
| **2.1 b) Notify provider if the patient has a positive fluid balance and/or has a urine output of < 0.5 mL/kg per hour.** | | * Poor or no urine output may be a sign of excessive drain losses hence hypovolemia and poor perfusion to kidneys. * It is important data to share and can be easily communicated. The impracticality of it lies in the calculation. * prevent renal dysfunction. * Early intervention will prevent this. * Recordkeeping of informing doctor. * Urine output can be affected by medications, it is not also an effective tool to monitor fluid balance. * An essential intervention -action should be taken sooner rather than later and the sooner the provider is informed the earlier corrective measures can be taken. * Who is the provider? Dr or Nurse? Can we troubleshoot X1 incident of UO&lt;0,5ml/kg/hr or do we report it- any evidence for this? * Early identification of AKI and its associated management can help patient survival. | 2.1 b) Notify treating doctor/surgeon if the patient has a positive fluid balance and/or has a urine output of < 0.5 mL/kg per hour. |
| **2.1 c) Assess for peripheral oedema.** | | * Plasma proteins like Albumin could be low hence fluid in the extravascular compartment. * oedema could be a late sign prevent pulmonary oedema. * Part of Nursing assessment and report. * Important to note that peripheral oedema will be more prominent in the sacral position in the supine patient. * Frequency? * Assessment can be subjective. * this can also give an idea of the fluid status and may guide medical therapies to aid in mobilising fluids in the body. | 2.1 c) Continuous assess for peripheral oedema. |
| **2.1 d) Monitor laboratory results, including haemoglobin and haematocrit levels, blood urea nitrogen and creatinine levels, and serum/urine osmolality, and report as needed.** | | * Ensure electrolyte balance. * The nurses don't have access to the website for patients' results and it can't be expected that they routinely check results. This, in my experience, is the doctors' responsibility. * prevent acute kidney injury. * This is largely a system issue - in state systems the doctors do this in ICU as there is usually in-house doctors, while this statement is more appropriate for private sector facilities | 2.1 d) Monitor laboratory results, including haemoglobin and haematocrit levels, blood urea nitrogen and creatinine levels, and serum/urine osmolality, albumin, and report as needed. |
| **2.1 e) Assess patient response to fluids, blood transfusions, and diuretics needed.** | | * Check skin colour, confirm haemoglobin, urine output test for specific gravity. * This entails reviewing typical parameters such as heart rate, urine output, etc. It can also be assessed with routine blood gases. * Again, prevent acute kidney injury and renal dysfunction. * Bedside staff can identify issues early and more accurately. Accompanied by successful reporting it can lead to early interventions that improve patient outcomes | 2.1 e) No refinement required |
| **2.1 f) Establish patient-specific goal-directed parameters for volume resuscitation in collaboration with the provider to prevent volume overload and positive fluid balance.** | | * Proper assessment with individualised care. * each patient to be considered individually using the ideal body weight. * It is of utmost importance that goals and targets of therapy for the 12 hours of each shift are clearly discussed and outlined by medical and nursing staff involved. A clear roadmap is needed to optimise outcome. * Guidelines to fluid resuscitation not followed where I work. * Not a nurse task! | 2.1 f) Establish patient-specific goal-directed parameters for volume resuscitation in collaboration with the provider to prevent volume overload and positive fluid balance. Consider using the ROSE concept in collaboration with the treating doctor/surgeon |
| **2.1 g) When possible, use volumetric (Stroke Volume (SV), Pulse Pressure Variation (PPV), or Stroke volume variation (SVV) rather than pressure-based (Central venous pressure (CVP) or Pulmonary Capillary Wedge Pressure (PCWP) end points of volume resuscitation.** | | * If proper advanced hemodynamic monitoring devices are available. But your CVP and Wedge pressures can still be used if it is the only device. * This is advanced cardiac monitoring which often needs senior doctors to review. Many parameters can be readily interpreted but others can be more difficult. * where possible depending on the equipment’s available in your institution * This is dependent on the availability of monitoring equipment to achieve this. * Depends on availability of Cardiac Output monitors Limited resources. * Not every unit has access to monitor these readings. * International guidelines clearly show that dynamic variables of fluid responsiveness (SVV,PPV etc) are clearly superior to static fixed measurements such as CVP (that only has a 50 %) accuracy. Availability of these monitors may be a problem however in our setting. * Use assistance of clinical technologist to connect monitors. * Resources not available in all centres. Cardiomyopathy can affect this. * not nurse task! * This will depend on the availability of measuring devices in the institution/s. * If there is limited access to invasive hemodynamic monitoring, this won't be feasible. | 2.1 g) When possible and depending on availability, use advanced haemodynamic monitoring, as a guide on fluid status and fluid resuscitation. Such as (Stroke Volume (SV), Pulse Pressure Variation (PPV), or Stroke volume variation (SVV) and EVLWI (Extra vascular lung water index). |
| **2.2. Nursing interventions for managing the fluid balance:** | | | |
| **2.2 a) Maintain euvolemia or negative fluid balance through patient-specific strategies for fluid management.** | | * Proper assessment patient specific care. * The patient's clinical picture often precludes maintaining a negative balance. There may also be other confounding features, e.g., anuria in the presence of abdominal hypertension, making it harder to maintain a negative balance. * in depth understanding of this concept is needed for the RN to ensure the correct implementation. * Monitor and correct this very important. * Nurses must regard fluid as medication. Ensure clinicians prescribe it, not allow infusions to run indefinitely. * What about incentive losses from the open abdomen? * Difficult in resuscitation phase to maintain negative fluid balance. * Not nurse task! | 2.2a) No refinement required |
| **2.2 b) When interventions to lower intra-abdominal hypertension are failing in the presence of worsening organ failure, collaboration with the surgical team will become necessary.** | | * For proper surgical intervention. * The surgical team needs to avail themselves should this problem arise. However, in practice, they are not always amenable to assisting. * Doctors to monitor patients closely in collaboration with nurses. * Nurses need to know that Critical care is a Practical practice implementing all acquired previous knowledge and needs to relay and record all findings. * Surgical team may not always be available to assist with surgery. * Shouldn’t we consult them earlier? When is first signs of increased IAP detected? * Depends on nurse interaction with doctor. * Early intervention can identify ischemic bowel and need for surgical removal/ decision for end-of-life care. | 2.2 b) When interventions to lower intra-abdominal hypertension are failing in the presence of worsening organ failure, early collaboration with the surgical team will become necessary. |
| **Original nursing guideline statement** | | **Comments from experts** | **Refined nursing guideline statement** |
| **Nursing guideline statement 3: Abdominal closure** | | | |
|  | | * Patient specific. All will be patient response dependent. * This is seldom easy or practical. It is important in order to ensure adequate closure but in our practice, it is often prevented by lack of resources, e.g. equipment or theatre time. * patients with open abdomens are usually very sick and easily get nosocomial infections so closing the abdomen as soon as possible is good for patients as long as there’s no infection. * It is the clinician’s discretion. * Have nurses adequately trained otherwise can be a mess? * Not nurse task! * While important it is not really something that the nurse can facilitate as such | Aim for early and same hospital stay abdominal fascial closure, ensuring that the negative pressure wound therapy is optimal and functional. Ensure for adequate wound care and wound care training for the nurses. |
| **Accompanying nursing interventions** | | | |
| **Original nursing intervention** | | **Comment from experts** | **Refined nursing intervention** |
| **3.1. Nursing interventions for facilitating abdominal closure:** | | | |
| **3.1 a) Various methods may be used to help close the abdomen, including, but not limited to negative pressure wound therapy and dynamic fascial tension devices/systems.** | | * Proper assessment to be initiated. * VAC dressings are time-consuming and sometimes complicated (e.g. patients with entercutaneous fistualae). However, this task often does fall to the nursing and is routinely performed. The devices/systems mentioned are not readily available and more training is needed when it comes to managing them. * Dependent on availability of these devices/systems to achieve this goal. * One doesn’t always have access to the necessary wound therapy. * These are often specialised systems that require additional training and consumables and very often need to be done under sedation. Most often need a wound care specialist or the treating surgeon to be involved. * Availability of fascial tension devises. * Depends on patient, high wound exudate can make this very difficult. * Not nurse task! * Wound care nurse input is needed. * this will also be influenced by availability of devices at the institution. * Not all nurses have the correct knowledge or skill to provide npwt. | 3.1 a) Various methods may be used to help close the abdomen, depending on availability, including, but not limited to negative-pressure wound therapy and dynamic fascial tension devices/systems**.** |
| **3.1 b) Nurses should be competent with systems used in their individual practice environments.** | | * Continuous in-service training, product realisation. * if the tools are available yes * Nurses in general are not very familiar with advances wound care management and rely on the specialist wound care practitioner to manage the wound. I my opinion this lack of knowledge should be addressed to contribute to an improved team effort. * Depends on in service training and skills of practitioner. * Training is important. * In service training to be provided to staff if unsure about device use * Depends on nurse competency and willingness to ask for guidance if unsure. * If knowledge gaps are present, training needs to be initiated/encouraged. * Nurses are often uneducated regarding new wound systems or compliwound closure systems. then wounds would be left unattended for few days without intervention. Inservice training should be initiated. | 3.1 b) Nurses should be competent with systems used in their individual practice environments. Allow for regular in-service and training on latest devices available**.** |
| **3.2. Nursing assessment and management of the temporary abdominal closure device.** | | | |
| **3.2 a) Monitor for proper function of the temporary abdominal closure device, skin/tissue circulation and integrity compromise that may be associated with dynamic tension or closure devices, fistula formation, increase in intra-abdominal hypertension after application or adjustment of dynamic tension devices, and intra-abdominal hypertension after fascia and/or skin closure.** | | * To assess for any complications. * It can be difficult to monitor for some of these, especially in the open abdomen which has had multiple surgeries and with the use of advanced devices (that staff may not be familiar with). But in general, assessing these parameters should be part of routine checking. * Knowledge and understanding of the device / system is needed to monitor efficacy. * As stated above the nurse is most often the first person to notice areas of concern wounds or dressing sites -as soon as any concerns are noted it must be reported to the relevant clinician and or wound care sister. * Still requires clinicians’ assessment.   Depends on accurate and continuous monitoring of patient by care giver. | 3.2a) No refinement required |
| **3.2 b) Monitor the integrity and function of the temporary abdominal closure device and monitor for changes in drainage volume and appearance.** | | * Continuous assessment. * This requires training with the device in order to understand if there is a problem with it and how to manage it. * Knowledge and understanding of the device / system is needed to monitor efficacy. * Requires adequate training. * Frequency? | 3.2 b) Continuous monitoring of the integrity and function of the temporary abdominal closure device and monitor for changes in drainage volume and appearance. |
| **3.2 c) Maintain the function of the temporary abdominal closure device.** | | * Ensure that the device functions properly. * The nurses have several other duties, and they cannot be in charge of routine maintenance of certain devices, especially those they are not familiar with. * Knowledge and understanding of the device / system is needed to monitor efficacy. * It maybe labour intensive. The challenges of staffing ratios. * Failure to work as intended can have critical consequences. * If the nurse knows how the system work, yes. If not. Then monitoring and maintenance thereof is a problem. | 3.2c) No refinement required |
| **Original nursing guideline statement** | | **Comments from experts** | **Refined nursing guideline statement** |
| **Nursing guideline statement 4: Nutrition** | | | |
| **a) No recommendations can be made related to the optimal timing of nutrition in intra-abdominal hypertension/abdominal compartment syndrome. However, several studies suggest that the use of early enteral nutrition in the open abdomen is safe and have demonstrated earlier fascial closure rates and fewer complications.** | | * Very important to give patient adequate nutrients, parenteral or enteral. Prokinetics may be contraindicated in some situations. * Close collaboration with the clinician and the dietician is essential in these complex patients. * Surgical and dietician teams need to be involved in feeding strategies to ensure safe feeding that is catered to individual patient needs. * early feeding has the benefit of aiding in recovery and maintain a positive nitrogen balance. * Supplemental parenteral nutrition should, however, not be stated for the first 3 days of non-enteral feeding but should be delayed in most patients to day 4 or 5. | a) No recommendations can be made related to the optimal timing of nutrition in intra-abdominal hypertension/abdominal compartment syndrome, as it is patient specific. However, several studies suggest that the use of early enteral nutrition in the open abdomen is safe and have demonstrated earlier fascial closure rates and fewer complications.  b) Advocate for gastric and colonic prokinetic agents.  c) Work closely with the dietician and surgeon for an early and optimal feeding plan to ensure gastric motility and to prevent paralytic ileus. (Multidisciplinary approach)  d) Monitor for refeeding syndrome, by monitoring for hypophosphatemia and hypomagnesemia. Replace electrolytes as needed in collaboration with unit protocol or treating doctor/surgeons’ prescription. |
| **b) It is recommended to initiate gastric and colonic prokinetic agents.** | | * For gastric motility and prevent paralytic ileus. Gastric residual volumes should no longer be routinely measured. * Doctor preference might influence the implementation in private sector facilities. * Following new evidence-based practices is very important. * Not nurse task! |
| **Accompanying nursing interventions** | | | |
| **Original nursing intervention** | | **Comments from experts** | **Refined nursing intervention** |
| **4.1 a) Formal nutrition evaluation should be considered in the patient with an open abdomen.** | | * Check the urea and electrolytes levels. * This responsibility lies with the nutritionist/dietician (in collaboration with the entire team). * liase with the dietician to prescribe the correct feeds. * Knowledge on nutrition will be required, often left for the dietician to evaluate. * This must be done in conjunction with a dietician that is experienced in managing these patients. * Depends on MDT resources. Should be done with or by a dietician. Not nurse task! From dieticians’ side | 4.1 a) Formal nutrition evaluation should be considered in the patient with an open abdomen in collaboration with the dietician and the treating doctor/surgeon. |
| **4.1 b) Monitor accurate intake and output and consult dietician for recommendations.** | | * Dieticians assist and calculate caloric requirements. not nurse task! * Dietician should be consulted early to avoid nutrition deficiencies and the complications thereof. | 4.1b) No refinement required |
| **4.1 c) Initiate enteral nutrition as soon as possible in the patient with an open abdomen who is not in shock or undergoing active resuscitation.** | | * Important depending on the surgery. add "or where there is bowel discontinuity”. * Equipment may not always be readily available. Bolus feeding is laborious and time-consuming. * Nutrition part of the recovery process * RN can advocate however often left to the treating physician and dietitian to implement. * Early nutrition helps to prevent abdominal necrosis. * Not nurse task! | 4.1 c) Initiate enteral nutrition as soon as possible in the patient with an open abdomen who is not in shock or post damage control surgery or undergoing active resuscitation, in collaboration with the treating doctor/surgeon and dietician. |
| **4.1 d) Limit interruptions in enteral nutrition.** | | * Continuous feeds and aspirate to check for absorption. * Several unanticipated and unavoidable events can happen that could interrupt feeding, e.g., transporting to CT scan. * At times patients are unable to absorb feeds and the bowel needs to recover post operatively * At times feeds are interrupted for an extended period as patient is "waiting for theatre" | 4.1 d) Limit interruptions in enteral nutrition. Aspirate enteral feeds to monitor absorption. |
| **4.1.e) If IAP remains elevated, discuss with provider whether gastric and colonic prokinetic agents (eg, metoclopramide, erythromycin, neostigmine) are appropriate for the patient.** | | * Individualised care. * RN would require training on this and need to advocate for the patient. * Shouldn’t we first assess whether the cause is enteral mobility related? | 4.1.e) If IAP remains elevated, discuss with treating doctor/surgeon whether gastric and colonic prokinetic agents (eg, metoclopramide, erythromycin, neostigmine) are appropriate for the patient**.** |
| **4.1 f) If intra-abdominal pressure remains elevated, collaborate with the nutritionist and provider to minimize or discontinue enteral nutrition.** | | * Distension might indicate poor absorption. * There are no nutritionists in the hospital. * These patients are very complex to manage and need continuous reassessment and discussion with all involved parties -particularly the nursing sister, clinician (surgeon and intensivist) and the dietician. * Would add "after all other steps to decrease pressure have been performed" | 4.1 f) If intra-abdominal pressure remains elevated, collaborate with the nutritionist and treating doctor/surgeon to minimize or discontinue enteral nutrition. |
| **Original nursing guideline statement** | | **Comments from experts** | **Refined nursing guideline statement** |
| **Nursing guideline statement 5: Analgesia and sedation** | | | |
| It is suggested that clinicians ensure that critically ill or injured patients receive optimal pain and anxiety relief. | | * Patients should be given analgesia for pain control and sedation only for patient discomfort. Use available pain and sedation assessment tools. * Analgesia is important to ensure patient recovery and comfort. However, it should be noted that complete absence of pain is not the goal, rather pain that is manageable, is. This is important as overzealous use of opioids can negatively impact on the bowel. * pain and anxiety if not treated can be a big source of stress for a patient who is already very sick. * All patients with open abdomens need optimised analgesia - sedation should be carefully considered and discussed with the clinician -weighing up the risks and benefits. Not all patients with open abdomens need sedation. * Target pain scoring. * Well done on distinguishing the difference! * Stress can delay wound healing. Patient safety should also be considered if they become too anxious or restless with a risk of self-harm (accidentally or intentionally).   Non-opioid based analgesic regimen to prevent the development of a post-surgical ileus. | It is suggested to ensure that critically ill or injured patients receive optimal pain and anxiety relief. Consider non-opioid based analgesia to prevent the development of a paralytic ileus, post-surgery. Make use of pain assessing tools to guide pain management, as suggested in latest research, the Critical care pain observation tool (CPOT) or the Behavioural pain scale (BAS). |
| **Accompanying nursing interventions** | | | |
| **Original nursing intervention** | | **Comments from experts** | **Refined nursing intervention** |
| **5.1 a) Assess for pain by using a standardized pain assessment scale; assess for anxiety.** | | * Use available tools. * Communication with the patient is important but it might not be easy for the routine application of standardised methods of assessing anxiety or pain, e.g. in situations where a language barrier exists. Pain scales charted use the tools available in your specific hospitals. * Implementation is practical, however pharmacological knowledge is required as not to administer analgesia that may decrease motility. * Assessment of sedation and pain in the critically ill patient is neglected. Include a instrument to guide these assessments e.g. RASS for sedation and some kind of NVPS * Optimising analgesia -using multiple modalities -ideally minimising opioids is one of the most important aspects of managing these patients. * Does anxiety always pain related? * Not implemented in some working environments, or no protocols exists * For patients who are conscious, co-operative and not on high-dose sedation | **5.1a) No refinement required** |
| **5.1 b) Use pharmacologic and nonpharmacologic pain management strategies to relieve pain, while limiting associated complications such as oversedation.** | | * Sedation to be used for discomfort not for pain. know the signs of pain e.g., tachycardia, high blood pressure, restlessness, and sweating. * This can sometimes result in a very restless patient who is difficult to manage. * Very important to intervene in Nursing. * ICU’s can be very noisy and distressing despite nurses best attempt to provide a safe and calming environment. * Not nurse task! * May be practical but often difficult in ICU patients | 5.1 b) Use pharmacologic and nonpharmacologic pain management strategies to relieve pain as prescribed, while limiting associated complications such as oversedation or paralytic ileus. |