Araştırma Makalesi
Research Article

Assessment of postoperative complications in a university hospital in Turkey: A retrospective cohort study

TÜRKİYE'DE BİR ÜNİVERSİTE HASTANESİNDE POSTOPERATİF KOMPLİKASYONLARIN DEĞERLENDİRİLMESİ: RETROSPEKTİF KOHORT ÇALIŞMA

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ABSTRACT

Objective: Postoperative anesthetic complications can be predicted by evaluating the conditions that occur during preoperative evaluation and peroperative follow-up. In addition, the type and duration of surgery as well as the anesthesia technique are also important for postoperative morbidity. With this study, it was aimed to determine the frequency and types of complications in the postoperative period and to guide the future studies for peroperative care improvement.

Materials and Methods: This study included the patients who had underwent operation and admitted to the postoperative recovery unit between 2016 and 2017. Demographic data, anesthesia method, surgery type and duration, co-morbidities, recovery score, and type of postoperative complication were recorded via a study form which also included the cut-off values for possible complications. The data were assessed by SPSS 21 program.

Results: It was found that postoperative complications developed in 0.87% (n=105) of 12,051 patients. The mean age was 47.3 years, 57.1% women (n=60), 42.9% men (n=45), the average operation time was 2.1 hours, and the recovery score was 9.6 on average. General anesthesia was performed in 99% of patients. The most common postoperative complications respectively were found to be vomiting (32.4%), nausea (28.6%) and hypoxemia (27.6%).

Conclusion: Detailed evaluation in the preoperative period and improvement of the peroperative care is important to prevent postoperative complications. As a clinical strategy, recording and evaluating postoperative complications will be a guide for improving the pre- and intraoperative care conditions of prospective patients.

Keywords: Anesthesia, morbidity, Postoperative nausea and vomiting

ÖZ

Amaç: Postoperatif anestezik komplikasyonlar, preoperatif değerlendirme ve peroperatif takip esnasında ortaya çıkan durumların değerlendirilmesi ile öngörülebilir. Buna ek olarak, ameliyatın türü, süresi, anestezi tekniği de

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DEU Tıp Derg 2021;35(1): 99 - 107
J DEU Med 2021;35(1): 99 - 107
doi: 10.5505/deutfd.2021.71135

Gönderim tarihi / Submitted: 14.02.2021
Kabul tarihi / Accepted: 01.03.2021

postoperatif morbidite için önemlidir. Bu çalışma ile postoperatif dönemde komplikasyonların sıklığı ile tiplerinin belirlenmesi ve gelecekteki peroperatif tiplerinin belirlenmesi ve gelecekteki peroperatif bakım iyileştirme çalışmalarına yön verilmesi amaçlanmıştır.

Gereç ve Yöntem: Bu çalışma, 2016-2017 yılları arasında cerrahi uygulanmış ve postoperatif derlenme ünitesine kabul edilmiş olan hastaları kapsamaktadır. Demografik veriler, anestezi yöntemi, cerrahi tipi ve süresi, komorbidite, derlenme skoru ve postoperatif komplikasyon tipi, olası komplikasyonlar ile ilgili kestirim değerlerinin de tanımlı olduğu, çalışma formuna kaydedildi. Veriler SPSS 21 programı ile değerlendirildi.

Bulgular: Toplam 12.051 hastanın %0,87'sinde (n=105) postoperatif komplikasyon geliştiği bulundu. Ortalama yaş 47,3 yıl, %57,1 kadın (n=60), %42,9 erkek (n=45), ortalama operasyon süresi 2,1 saat ve derlenme skoru 9,6 idi. Hastaların %99'una genel anestezi uygulandı. En sık gözlenen postoperatif komplikasyonlar sırası ile kusma (%32,4), bulantı (%28,6) ve hipoksemi (%27,6) olarak saptandı.

Sonuç: Preoperatif dönemde detaylı değerlendirme ve peroperatif bakımın iyileştirilmesi postoperatif komplikasyonları önlemek için önemlidir. Klinik bir strateji olarak, postoperatif komplikasyonların kaydedilmesi ve değerlendirilmesinin, ileriye dönük hastaların ameliyat öncesi ve sırasındaki bakım koşullarının iyileştirilmesi için bir rehber olacağı görüşündeyiz.

Anahtar Sözcükler: Anestezi, morbidite, postoperatif bulantı ve kusma

Physiological disorders that affect multiple organ systems may be observed during the recovery period from anesthesia (1). The most common of these are postoperative nausea-vomiting (PONV), hypoxia, hypothermia and cardiovascular instability, some of which can be detected during preoperative evaluation, some may occur in relation to the type, duration of surgery or anesthesia technique. Historically, it is thought that the application of anesthesia is important only during surgery, but today it is seen that preoperative evaluation and intraoperative follow-up methods are given great importance.

Respiratory, cardiac or cognitive dysfunction may occur in patients due to pain in the early postoperative period. In the treatment of postoperative pain, studies have proven that the multimodal approach is more effective than of opioid-based analgesia treatment (2). With this approach, complications such as nausea-vomiting, respiratory depression, decreased GIS motility, and urinary retention arising due to opioids are also prevented. Factors such as short-acting anesthetic agents and more frequent use of outpatient surgery make postoperative recovery faster and more trouble-free. At the same time, choosing a short-acting agent for preoperative medication will also be effective in recovery from anesthesia.

It is known that the etiology of PONV is multifactorial. These factors are reported to be related to the patient, surgical procedure or anesthesia technique. In addition, PONV may occur not only in the early postoperative period but also in the later period. Hydration and antiemetic agents are recommended in the treatment, but there is no consensus on the routine application of these treatments to each patient and the creation of a treatment plan according to the patient is among the recommendations (3).

Due to reasons such as long waiting time in the preoperative waiting area, infusion of large amounts of unheated fluids in the intraoperative period, large surgical incision, tremor may be observed in patients, especially in the first hours after the operation. Measurement and follow-up of body temperature are important for early detection of hypothermia and prevention of shivering. However, patients should be warmed with warm covers or external heaters.

Monitoring the vital signs of each patient transferred to the postoperative recovery unit by the healthcare worker in charge will ensure early detection and prevention of possible complications. Along with monitoring, some scoring systems are also helpful in the decision to transfer patients from the postoperative recovery unit.

Our aim with this study is to improve the quality of peroperative applications by determining the frequency and types of complications seen in the postoperative period in our clinic.

MATERIAL and METHODS

A study form was prepared which included the demographic information of the patients, anesthesia method, type of operation, presence of additional disease, recovery score, and type of postoperative complications. The cut-off values for possible complications in the study were also defined on the form. Data was recorded for the patients who underwent surgery and anesthesia between 01.06.2016-01.06.2017 at the Mersin University Medical Faculty Hospital (Appendice 1).

Modified Aldrete Score (Table 1) was preferred as the postoperative recovery score. Patients who scored eight and above according to the Modified Aldrete Score were transferred to the relevant department services. If the patient's score is below eight, the patients were followed up by applying the necessary intervention. This form was filled in by the health officer or nurses working in the postoperative recovery unit.

In case of any complication in the patients, the anesthesiologist who applied anesthesia to that patient was informed and the necessary intervention (such as respiratory support, elimination of analgesic need, PONV treatment) was performed.

Oriented - cooperative patients between the ages of 18 and 75 years were included in the study, whereas patients who were <18 or >75 years of age, who were not oriented - who were not cooperated and were not admitted to the postoperative recovery unit were excluded from the study.

After the data were recorded in the SPSS 21 program, they were evaluated by the Mersin University Faculty of Medicine, Department of Biostatistics and Medical Informatics. Continuous variables were expressed as mean and standard deviation, and categorical variables as numbers and percentages. Comparisons were evaluated on frequency.

This study has been approved by the Ethics Committee for Clinical Research in Mersin University (date: 13.07.2017/ number: 206).

Table 1. Modified Aldrete Score Used in the Postoperative Recovery Unit

MODIFIED ALDRETE SCORE		
Activity	Four extremities (Four extremities are moving)	2
	Two extremities (Two extremities are moving)	1
	No movement	0
Breathing	Can breathe deeply and cough	2
	Dyspnea, superficial breathing	1
	Apnea and obstruction	0
Blood Pressure	Blood pressure ± 20 mmHg of normal	2
	Blood pressure ± 20-50 mmHg of normal	1
	Blood pressure more than ±50 mmHg of normal	0
Consciousness	Fully awake, orientated	2
	Arousable on calling	1
	Not responsive	0
Oxygen Saturation	100-98 %	2
	97-95 %	1
	< 95 %	0
Total Points		

RESULTS

17,460 patients were evaluated in the postoperative recovery unit on the specified dates. Of them 5,409 were excluded due to exclusion criteria. Totally 12,051 patients were included to the study.

Postoperative complications were detected in 167 (1.38%) of 12,051 patients who underwent operation. The average age of patients with complications, their distribution by gender, average operation duration, and recovery score averages are shown in Table 2. General anesthesia (totally both inhalational and intravenous anesthesia) was used as anesthesia method in 99% of the patients, and regional anesthesia was used in 1% in the patients whom the complications were occurred.

According to the American Society of Anesthesiology (ASA) scores, 78 patients were ASA 1 (46.7%), 68 patients were ASA 2 (40.7%) and 21 patients were ASA 3 (12.6%).

Complications detected in patients are shown in Table 3. Surgical types of the patients are shown in Table 4.

The ratio of the patients who developed postoperative hypoxia were 47.5% of ASA Score 1, 35% ASA Score 2, and 17.5% ASA Score 3. Postoperative hypoxia was observed most frequently (35%) after abdominal surgery, then orthopedic surgery (27.5%) and emergency surgery (5%), respectively.

When the distribution of postoperative nausea incidence by gender was examined, it was 61.4% (n: 35) in women and 38.6% (n: 22) in men. Postoperative vomiting was 63.6% (n: 35) in women and 36.4% (n: 20) in men.

The incidence of postoperative hypertension according to the type of surgery was 0% for emergency surgery, 18.1% for orthopedic surgery, 27.2% for abdominal surgery, and 54.5% for other types of surgery.

Table 2. Age, Gender, Operation time, and Recovery scores of the patients.

Demographic data		
Age (year) (mean±SD)		47.09±19.76
Gender (%)	Female (n=97)	58.1
	Male (n=70)	41.9
Operation time (hour) (mean±SD)		1.9±1.48
Recovery score (mean±SD)		9.6±0.84

Table 3. Distribution of complications observed in patients

Complications		**(%)**	**(n)**
Nausea		34.1	57
Vomiting		32.9	55
Airway obstruction	The tongue behind the pharynx	16.2	27
	Laryngospasm	4.2	7
	Glottic edema	4.2	7
	Blood, secretion in the airway	3.6	6
	External compression to trachea	0	0
Hypoxemia		24	40
Hypotension		4.2	7
Hypertension		6.6	11
Arrhythmia		4.8	8
Unconsciousness		0.6	1
Hypothermia		4.2	7

Table 4. Distribution of patients according to the types of surgery performed

Type of surgery	**(n)**	**(%)**
Emergency	4	2.4
Orthopedic surgery	41	24.6
Abdominal surgery	49	29.3
Others	73	43.7

DISCUSSION

According to the findings of our study, the most common postoperative complication was found to be nausea. In the second order, vomiting was found. Postoperative nausea-vomiting is still one of the most common postoperative complications (20-40%) despite all the studies conducted on this subject and the use of prophylactic antiemetics (1). Causes such as the type of surgery performed, the presence of previous nausea-vomiting history in the patient, female gender, duration of the operation, opioid use increase the risk of PONV (4). It was not surprising that nausea and vomiting were observed in the first place in the patients included in the study.

When the relationship between gender with nausea and vomiting was examined, the rate of both nausea and vomiting was found to be higher in women.

With the Modified Aldrete Score, which was first published in 1970 and revised in 1995, it was decided to leave the postoperative recovery unit and the complications that occurred were recorded. While a score of 10 out of 15 according to this scoring calculated by the patient's activity, respiration, circulation, consciousness and color assessment is considered sufficient for the patient to be discharged, there are publications suggesting that a minimum score of 9 will be sufficient (5,6). According to the findings in our study, the mean recovery score of the patients was determined as 9.6, which is suitable for discharging patients from the recovery unit.

Postoperative hypoxemia is resulted from many reasons. Often, it may occur due to the development of atelectasis during the operation, the administration of opioids for analgesia, the transfer of patients from the operating room to the recovery unit without completely reversing the muscle relaxant effect (4). In the study conducted by Sun et al. in 2015, it was reported that postoperative hypoxemia may lead to serious secondary problems such as brain dysfunction, dysrhythmia and myocardial ischemia (7). In our study, it was unexpected to find a high rate of postoperative hypoxemia, because before this study was started, the incidence was unknown. This result has greatly increased our awareness of this issue. However, it was found that only 3 out of 40 patients who developed hypoxia developed arrhythmia, which was accepted because of the early application of hypoxia treatment without rhythm disturbance. The relationship between ASA Score and probability of re-intubation was studied before (8). When the relationship between the ASA score and the development of postoperative hypoxemia was examined in our study, it was found that the majority of patients with hypoxemia were evaluated as ASA I, the second was observed in patients who were evaluated as ASA II, and contrary to what was expected, the patients with the least hypoxemia were those evaluated as ASA III.

In the postoperative period, airway obstruction may occur due to tongue leaking into the posterior oropharynx, blood or secretion, laryngospasm, acute hemorrhage (9). Obstruction in the upper airway can cause many catastrophic situations (10). In our study, it was determined that the most common cause of airway obstruction was falling the tongue into the posterior oropharynx. The reason of this problem could be inadequate muscle strength, the insufficiency of reversal of neuromuscular blocking agents or early transfer from the operating room to the recovery room. This problem has been eliminated by applying various airway maneuvers and verbal stimulation. In addition, airway ostruction was observed in our patients due to other reasons; however, obstruction was resolved with the correction of the underlying cause. This finding has strengthened that patients were transferred from the operating rooms to the recovery unit before their muscle strength was fully restored but the neuromuscular monitoring was not applied to all the patients.

Cardiac problems may be encountered in addition to airway and oxygenation problems in the postoperative period. Factors such as hypermetabolism, sympathetic stimulation and hypoxemia play a role in the pathogenesis of postoperative cardiac complications (11). In the study conducted by Michard et al., development of both hypotension and hypertension in the postoperative period were found to be associated with increased morbidity and mortality (12). The most common cardiac complication in our study was hypertension. It was determined that this complication was followed by arrhythmia and hypotension

development, respectively. Postoperative blood pressure regulation is known to be a complex condition that is affected by the characteristics of the patient or the procedure performed and the perioperative care.

Although the incidence of postoperative hypertension varied between 5-20% after non-cardiac surgery, it was found to be associated with stroke, myocardial damage - infarction or bleeding. According to a recently published study, systolic blood pressure > 180 mmHg and diastolic blood pressure > 110 mmHg are signs of risk (13). "Acute postoperative hypertension" is defined as a significant high blood pressure that can lead to serious neurological, cardiovascular or surgical field complications in the early postoperative period. Patients who develop acute postoperative hypertension should be ensured of adequate ventilation and analgesia before being evaluated cardiologically. In the treatment of postoperative hypertension, it is recommended to first exclude the underlying cause (pain, urinary retention, hypoxemia, anxiety, etc.) and to initiate antihypertensive treatment if necessary (14). In our study, the development of hypertension was evaluated according to the types of surgery, but no clear result was obtained on this issue.

Postoperative hypotension can often occur due to hypovolemia. Especially in geriatric patients and patients with heart failure, it is recommended to be cautious in the treatment of hypotension. It is considered as an indicator of increased risk that postoperative systolic blood pressure < 90mmHg. It is known that if the patient has a history of preoperative hypertension, systolic blood pressure > 90mmHg is also a matter of concern, it means the values of systolic blood pressures accepted normal for non-hypertensive patients can be low for patients with hypertension (15). There is no consensus on the exact value of what the postoperative blood pressure should be.

In our study, the incidence of hypotension was found to be low, but only the values of the patients in the postoperative recovery unit were examined. However, there are studies showing that postoperative hypotension is detected at least once in approximately 20% of patients between 0 and 3 days (16). In our study, when the types of surgery and the development of hypotension were evaluated, it was found that it mostly occurred after abdominal surgery. We think that fluid therapy applied in our clinic in abdominal surgery, which causes large fluid losses, may have increased the incidence of postoperative hypotension.

Arrhythmia in the postoperative period is also an important complication. Arrhythmia can occur due to causes such as hypothermia, electrolyte disturbance, pre-existing cardiac disease (congenital or acquired cardiac disease) (17). In our study, the rate of patients with arrhythmia in the postoperative period was found to be low, and the reason of arrhythmia were the preexisting cardiac diseases. In these patients, arrhythmia was treated by correcting the underlying cause.

The mechanism of postoperative neurological disorders is still not completely explained and is thought to be multifactorial (18). Postoperative unconsciousness can be seen from amnesia to delirium. In our study, unconsciousness was found in only one geriatric patient, and it was thought that the reason for the impaired consciousness in this patient was combination of opioid and prolongation of the effect of the anesthetic agent (thiopental sodium).

Hypothermia is considered to be a serious risk factor for patients undergoing surgery. It is known that postoperative hypothermia changes systemic and local physiology. It can lead to platelet dysfunction, coagulation disorders, increased incidence of postoperative infection and prolonged hospitalization, especially cardiac complications (such as myocardial damage, adrenergic response) (19). In our study, postoperative hypothermia was found in seven patients. Although a heated sheet was used for each patient admitted to the postoperative recovery unit, an external warming device was also used in addition to patients with hypothermia. No serious problems as abnormal heart rhythm or disturbances in vital signs related to hypothermia was encountered in these patients.

When all these findings were evaluated, decisions were made regarding the practices that could be performed in order to reduce the incidence of postoperative complications in our clinic.

It is known how important perioperative anesthesia management is in predicting and preventing problems that patients may encounter in the postoperative period. In the preoperative period, it is one of the primary tasks of the anesthesiologist to examine the patients in detail and optimize the situations that may pose risks. In this study, a higher rate of postoperative nausea and vomiting was found than reported in the literature. In order to optimize this result, routine prophylactic antiemetic application in specific surgeries (such as laparoscopic surgery, ear surgery), preoperative fasting period should not last longer than 6 hours, and patients should be given clear liquid orally 2 hours before the operation. In addition, the follow-up periods of patients with postoperative nausea and vomiting complaints were prolonged in the recovery unit. In order to prevent and / or reduce the hypoxia observed in the postoperative period, some changes have been implemented in the intraoperative ventilation strategy of the patients. These include practices such as minimizing the separation of patients' intubation tubes from the respiratory circuit, performing at least one recruitment maneuver in patients without contraindications, and avoiding high oxygen concentrations. In addition, it was ensured that the patients were not transferred to the recovery unit before the postoperative muscle strength was fully restored, and the use of the TOF device for muscle strength evaluation was increased. Another finding of us is the increased sensitivity in applying targeted fluid therapy to patients in order to reduce the incidence of hypotension in the postoperative acute period after abdominal surgery.

With all these findings and applications, we think that we emphasize the importance of the responsibility of the anesthesiologist in the postoperative recovery unit and raising the awareness of the team working together.

Main Points

• Close follow-up of patients admitted to the postoperative recovery room and recording their values are important in terms of detecting and resolving problems.

• Despite all developments in the field of anesthesiology, nausea and vomiting continue to be a serious problem that disrupts the quality of life. Factors that may cause PONV should be determined individually in patients, and nausea and vomiting should be tried to be prevented and treated with appropriate treatment options.

• Failure to fully evaluate muscle strength during the termination of anesthesia may lead to life-threatening problems that may arise in the postoperative period. In order to prevent this situation, quantitative measurement of muscle strength should be evaluated in every patient, if possible.

ACKNOWLEDGMENTS

The authors are grateful to Funda BARGU for her help in collecting study forms

REFERENCES

1. Nicholau TK. Chapter 96: The Postanesthesia Care Unit. In: Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL. Miller's Anesthesia 8th Edition. Elsevier; 2015: 2926.
2. Pogatzki-Zahna E.M., Segelckea D, Schug S.A. Postoperative pain—from mechanisms to treatment. Pain Rep. 2017;2: e588.
3. Kovac A L. Update on the Management of Postoperative Nausea and Vomiting. Drugs. 2013, 73:1525–47.
4. Kehlet H, Dahl J.B. Anaesthesia, surgery, and challenges in postoperative recovery. Lancet 2003; 362:1921–28.
5. Aldrete JA, Kroulik D. A postanesthetic recovery score. Anesth Analg. 1970;49:924-34.
6. Aldrete JA. The post-anesthesia recovery score revisited. J Clin Anesth. 1995;7:89-91.
7. Sun Z, Sessler DI, Dalton JE, Devereaux PJ, Shahinyan A, Naylor AJ et al. Postoperative Hypoxemia Is Common and Persistent: A Prospective Blinded Observational Study. Anesth Analg. 2015;121:709-15.
8. Brueckmann B, Villa-Uribe JL, Bateman BT, et al.: Development and validation of a score for prediction of postoperative respiratory

complications. Anesthesiology. 2013; 118: 1276–85.

9. Eikermann M, Santer P, Ramachandran SK., Pandit J. Recent advances in understanding and managing postoperative respiratory problems. F1000Research 2019, 8 (F1000 Faculty Rev):197.

10. Stige IH, Heian ST, Bremnes TA. Postoperative pulmonary oedema caused by upper airway obstruction. Tidsskr Nor Laegeforen. 2018;138. DOI: 10.4045/tidsskr.18.0139

11. Jun IJ, Kim J, Kim HG, Koh GH, Hwang JH, Kim YK. Risk factors of postoperative major adverse cardiac events after radical cystectomy: implication of diastolic dysfunction. Sci Rep. 2019; 9:14096.

12. Michard F, Biais M, Lobo SM, Futier E. Perioperative hemodynamic management 4.0. Best Pract Res Clin Anaesthesiol. 2019;33:247-55.

13. Mohammed Iddrisu S, Considine J, Hutchinson A. Frequency, nature and timing of clinical deterioration in the early post-operative period. J Clin Nurs 2018;27:3544-53

14. Haas CE, LeBlanc JM. Acute postoperative hypertension: a review of therapeutic options. Am J Health Syst Pharm 2004;61:1661e73.

15. McEvoy MD, Gupta R, Koepke EJ, Feldheiser A, Michard F, Levett D et al. Perioperative Quality Initiative consensus statement on postoperative blood pressure, risk and outcomes for elective surgery. Br J Anaesth. 2019;122:575-86.

16. Roshanov PS, Rochwerg B, Patel A, Salehian O, Duceppe E, Belley-Côté EP et al. Withholding versus continuing angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers before noncardiac surgery: an analysis of the Vascular events in noncardiac Surgery patIents cohort evaluation prospective cohort. Anesthesiology 2017;126:16-27.

17. Fritz BA, Escallier KE, Ben Abdallah A, Oberhaus J, Becker J, Geczi K et al. Convergent Validity of Three Methods for Measuring Postoperative Complications. Anesthesiology. 2016;124:1265-76.

18. Akelma H, Kilic ET, Salik F, Bicak EA, Kaya S. Postoperative cognitive dysfunction developed in donor nephrectomy- Case report. Niger J Clin Pract. 2019;22:877-80.

19. Kleimeyer J P, Harris A H, Sanford J, Maloney W J, Kadry B, Bishop J A. Incidence and Risk Factors for Postoperative Hypothermia After Orthopaedic Surgery. J Am Acad Orthop Surg 2018;26:e497-e503.

Appendice-1: Study form to be filled in the postoperative recovery unit for the patients

COMPLICATIONS IN POSTOPERATIVE CARE UNIT: STUDY FORM

Name-Surname:

Age:

Gender:

Type of Operation: Emergency surgery ☐
Orthopedic surgery ☐
Abdominal surgery ☐
Others: ☐

Anesthesia Method: Regional ☐ General Anesthesia ☐

Recovery Score:

ASA Status:

Operation Time:

Postoperative Complications:

a) Nausea (or retching)
b) Vomiting (Once or more)
c) Airway obstruction:
   - Falling the tongue to the posterior of the pharynx ☐
   - Laryngospasm ☐
   - Glottic edema ☐
   - Blood and secretions in the airway ☐
   - External compression of the trachea (neck hematoma) ☐
d) Hypoxemia (SpO_2 < 90%): Yes ☐ No ☐
e) Hypotension (Blood pressure < 90/50 mmHg)
f) Hypertension (Blood pressure > 140/80 mmHg)
g) Arrhythmia
h) Unconsciousness (Glascow Coma Scale < 10)
i) Hypothermia (Body temperature < 35.5^0C)