Complete Summary

GUIDELINE TITLE

Postoperative management in adults. A practical guide to postoperative care for clinical staff.

BIBLIOGRAPHIC SOURCE(S)

Scottish Intercollegiate Guidelines Network (SIGN). Postoperative management in adults. A practical guide to postoperative care for clinical staff. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2004 Aug. 56 p. (SIGN publication; no. 77). [132 references]

GUIDELINE STATUS

This is the current release of the guideline.

Any amendments to the guideline in the interim period will be noted on Scottish Intercollegiate Guidelines Network (SIGN) Web site.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
CONTRAINDICATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Conditions occurring during the postoperative period, including cardiovascular, respiratory, septic, renal, and nutritional complications

Note: The guideline does not focus on postoperative pain management, indications for blood transfusion, the prophylaxis of surgical site infection or venous thrombosis, or the management of obstetric patients or pregnant women or those patients with head injury or hip fracture (these are covered by separate SIGN guidelines; see www.sign.ac.uk). The guideline excludes the management of children (<18 years of age).

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention
Risk Assessment
Treatment

CLINICAL SPECIALTY

Anesthesiology
Cardiology
Family Practice
Infectious Diseases
Internal Medicine
Nephrology
Neurological Surgery
Nursing
Nutrition
Orthopedic Surgery
Physical Medicine and Rehabilitation
Plastic Surgery
Pulmonary Medicine
Surgery
Thoracic Surgery

INTENDED USERS

Advanced Practice Nurses
Dietitians
Nurses
Patients
Physical Therapists
Physician Assistants
Physicians
Respiratory Care Practitioners
Students

GUIDELINE OBJECTIVE(S)

To present evidence-based recommendations for best practice in postoperative management of adult patients

TARGET POPULATION

Adult patients in Scotland in need of postoperative care

Note: Obstetric patients, pregnant women, patients with head injury or hip fracture, and children (<18 years of age) are excluded from this guideline.

INTERVENTIONS AND PRACTICES CONSIDERED

Clinical Assessment and Monitoring

1. Criteria for discharge from postanaesthetic recovery
2. Postoperative assessments, treatment, and prophylaxis options
3. Monitoring requirements (routine and additional, depending on clinical status), including temperature, pulse rate, blood pressure, respiratory rate, pain assessment, urine output, peripheral oxygen saturation, electrocardiogram, and arterial blood gas analysis

Cardiovascular Management

1. Monitoring and control of heart rate and blood pressure, including administration of beta-blockers and intravenous nitrates
2. Assessment of risk for and prevention of myocardial ischaemia
3. Management of arrhythmias, conduction defects and perioperative myocardial infarction, including pharmacological management (e.g., amiodarone, magnesium sulphate, verapamil, diltiazem, esmolol, adenosine, lidocaine) or use of direct-current (DC) shock
4. Management of patients taking oral anticoagulants
5. Prevention of hypothermia
6. Maintenance of appropriate oxygen saturation
7. Diagnosis and management of cardiac failure

Respiratory Management

1. Assessment of risk factors for and reduction of postoperative pulmonary complications
2. Pulmonary monitoring, diagnosis and treatment of atelectasis, respiratory infection, and respiratory failure, including use of oxygen therapy and antibiotics
3. Postoperative physiotherapy

Fluid, Electrolyte and Renal Management

1. Invasive monitoring to assess fluid balance status
2. Assessment of risk factors for postoperative fluid or electrolyte disturbance and prophylaxis
3. Detection of overt clinical problems and management of volume depletion and overload
4. Assessment and treatment of oliguria
5. Assessment and treatment of sodium and potassium levels and acid/base balance

Management of Sepsis

1. Assessment of risk factors for infection and appropriate prophylaxis
2. Early identification and appropriate management of sepsis

Postoperative Nutrition

1. Avoidance of routine nasogastric intubation

2. Use of anti-emetics
3. Nutritional support requirements in malnourished patients
4. Use of artificial nutritional support and techniques for administration

MAJOR OUTCOMES CONSIDERED

- Patient recovery in the postanaesthesia period
- Quality of life, morbidity, and mortality
- Postoperative cardiac and pulmonary complications, infection, fluid or electrolyte disturbance
- Postoperative complications and mortality in malnourished patients and major complications associated with artificial nutritional support

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A systematic review of the literature was conducted using an explicit search strategy devised by a Scottish Intercollegiate Guidelines Network (SIGN) Information Officer in collaboration with members of the development group. Internet searches were conducted on the Web sites of the U.S. National Guidelines Clearinghouse, the Canadian Practice Guidelines Infobase, the Australian National Health and Medical Research Council, the New Zealand Guidelines programme, and the UK Health Technology Assessment programme. Searches were also conducted on the search engines Citeline, Medical World Search, Echidna, Medisearch, and Google, and all suitable links followed up. Database searches were conducted from 1993-2001 on the Cochrane Library, Medline, Embase, and CINAHL. The Medline version of the main search strategies is available on the SIGN Web site, in the section covering supplementary guideline material. The main searches were supplemented by literature identified by individual members of the development group. All selected papers were appraised using standard methodological checklists before conclusions were considered as evidence.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

1++: High quality meta-analyses, systematic reviews of randomized clinical trials, or randomized clinical trials with a very low risk of bias

1+: Well-conducted meta-analyses, systematic reviews, or randomized clinical trials with a low risk of bias

1-: Meta-analyses, systematic reviews, or randomized clinical trials with a high risk of bias

2++: High quality systematic reviews of case control or cohort or studies

High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

2+: Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal

3: Non-analytic studies (e.g. case reports, case series)

4: Expert opinion

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Although intended to be fully developed by consensus techniques, the guideline is in fact a hybrid of consensus and evidence based methodology. This situation arose when it became clear that several of the clinical issues which were chosen for inclusion in this guideline were supported by a robust evidence base and these were fed through the standard Scottish Intercollegiate Guidelines Network (SIGN) development process as described below. Following the systematic review of evidence, formal consensus was then applied to statements developed by specialist subgroups of the development group (see "Description of Methods Used to Formulate the Recommendations" field).

SIGN carries out comprehensive systematic reviews of the literature using customized search strategies applied to a number of electronic databases and the Internet. This is often an iterative process whereby the guideline development group will carry out a search for existing guidelines and systematic reviews in the first instance and, after the results of this search have been evaluated, the questions driving the search may be redefined and focused before proceeding to identify lower levels of evidence. Once papers have been selected as potential sources of evidence, the methodology used in each study is assessed to ensure its

validity. The result of this assessment will affect the level of evidence allocated to the paper, which will in turn influence the grade of recommendation that it supports.

Additional details can be found in the companion document: SIGN 50: A guideline developer's handbook. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network, 2004 May (SIGN publication No. 50), available from the SIGN Web site.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus
Expert Consensus (Delphi)
Expert Consensus (Nominal Group Technique)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Consensus Techniques

Nominal group technique (NGT) was used to identify 125 items important to the management of postoperative patients. Two further rounds of NGT reduced this list to 14 items which related to clinical assessment and monitoring, or cardiovascular; respiratory; fluid, electrolyte and renal, or sepsis management. The items were used to develop a set of "key questions" and used to develop the search strategy which forms the basis of the evidence based arm of the methodology.

The systematic review allowed the group to identify evidence gaps, that is, key questions that could not be answered using published evidence. For each of these questions, a consensus statement was prepared. The group reviewed the consensus statements and summaries of appraised evidence and rated privately all consensus statements using a 9-point scale where:

9 = extremely appropriate
5 = uncertain
1= extremely inappropriate

The group also listed all changes they would make to the consensus statement, based on both their interpretations of the literature review and their clinical experience.

An "appropriateness score" was calculated, which reflected the panel's collective opinion on the suitability of each consensus statement.

The appropriateness score for an individual statement is the median of the panel's ratings. The panel is considered to be:

- in agreement over the appropriateness of a statement when no more than 3 of the individual members' ratings are outside a 3-point region that includes the median rating

- disagreement occurs when 1 or more ratings is in the 1-3 region, and 1 or more in the 7-9 region
- clearly appropriate statements will have a median of 7-9 without disagreement
- clearly inappropriate statements will have a median of 1-3 without disagreement
- equivocal statements - with a median of 4-6, or where there is disagreement on a proper rating

Only "clearly appropriate" consensus statements, with a median score of 7-9, are used as consensus statements in this guideline.

Method for Evidence Based Recommendations

The process for synthesizing the evidence base to form graded guideline recommendations is illustrated in the companion document titled "SIGN 50: A Guideline Developers' Handbook." (Edinburgh [UK]: Scottish Intercollegiate Guidelines Network. [SIGN publication; no. 50]), available from the SIGN Web site.

Evidence tables should be compiled, summarizing all the validated studies identified from the systematic literature review relating to each key question. These evidence tables form an important part of the guideline development record and ensure that the basis of the guideline development group's recommendations is transparent.

In order to address how the guideline developer was able to arrive at their recommendations given the evidence they had to base them on, SIGN has introduced the concept of considered judgement.

Under the heading of considered judgement, guideline development groups are expected to summarise their view of the total body of evidence covered by each evidence table. This summary view is expected to cover the following aspects:

- Quantity, quality, and consistency of evidence
- Generalisability of study findings
- Applicability to the target population of the guideline
- Clinical impact (i.e., the extent of the impact on the target patient population, and the resources need to treat them.)

Guideline development groups are provided with a pro forma in which to record the main points from their considered judgement. Once they have considered these issues, the groups are asked to summarise their view of the evidence and assign a level of evidence to it, before going on to derive a graded recommendation.

The assignment of a level of evidence should involve all those on a particular guideline development group or subgroup involved with reviewing the evidence in relation to each specific question. The allocation of the associated grade of recommendation should involve participation of all members of the guideline development group. Where the guideline development group is unable to agree a

unanimous recommendation, the difference of opinion should be formally recorded and the reason for dissent noted.

The recommendation grading system is intended to place greater weight on the quality of the evidence supporting each recommendation and to emphasise that the body of evidence should be considered as a whole, and not rely on a single study to support each recommendation. It is also intended to allow more weight to be given to recommendations supported by good quality observational studies where randomised controlled trials (RCTs) are not available for practical or ethical reasons. Through the considered judgement process guideline developers are also able to downgrade a recommendation where they think the evidence is not generalisable, not directly applicable to the target population, or for other reasons is perceived as being weaker than a simple evaluation of the methodology would suggest.

On occasion, there is an important practical point that the guideline developer may wish to emphasise but for which there is not, nor is their likely to be, any research evidence. This will typically be where some aspect of treatment is regarded as such sound clinical practice that nobody is likely to question it. These are marked in the guideline as "good practice points." It must be emphasized that these are not an alternative to evidence-based recommendations, and should only be used where there is no alternative means of highlighting the issue.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

Grade A: At least one meta-analysis, systematic review of randomized controlled trials (RCTs), or randomized controlled trial rated as 1++ and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

Grade B: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1++ or 1+

Grade C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rate as 2++

Grade D: Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

A national open meeting is the main consultative phase of Scottish Intercollegiate Guidelines Network (SIGN) guideline development, at which the guideline development group presents their draft recommendations for the first time. A national open meeting for this report was held on 29th October 2002. The draft was also available on the SIGN Web site for a limited period to allow those unable to attend the meeting to contribute to the development of the guideline.

The guideline was also reviewed in draft form by independent expert referees.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Most of the recommendations are given as consensus statements (CS), which are statements developed from structured discussion, informed by any existing evidence and the development group's clinical experience, and validated using a formal scoring system.

For evidence-based recommendations, the strength of recommendation grading (A-D) and level of evidence (1++-4) are defined at the end of the "Major Recommendations" field.

Clinical Assessment and Monitoring

CS: Anaesthetic and surgical staff should record the following items in the patient's case notes:

- Any anaesthetic, surgical, or intraoperative complications
- Any specific postoperative instruction concerning possible problems
- Any specific treatment or prophylaxis required (e.g., fluids, nutrition, antibiotics, analgesia, anti-emetics, thromboprophylaxis)

Assessment

CS: A postoperative assessment should be carried out when the patient returns from theatre.

CS: Doctors immediately responsible for patients should ensure that a contact/pager number is available to the nursing staff on the ward.

CS: If the nurse responsible for the care of the patient becomes unavailable for discussions with other members of the care team, they should pass on all pertinent information to another member of nursing staff who then assumes responsibility for that patient.

CS: The first postoperative assessment should determine:

- Intraoperative history and postoperative instructions
- Circulatory volume status
- Respiratory status
- Mental status

CS: If an acute confusional state is present, exclude treatable causes by appropriate history, physical examination, and investigations.

CS: Patients at risk of deterioration require frequent assessment.

CS: Patients with the following risk factors for deterioration should be reassessed within two hours of the first postoperative assessment:

- American Society of Anesthesiologists (ASA) grade $\geq$3
- Emergency or high risk surgery
- Operation out of hours

Treatment and Prophylaxis

CS: Local protocols should be established for:

- Drug treatment of pre-existing cardiovascular and respiratory disorders
- Treatment of postoperative nausea and vomiting

Monitoring

CS: The doctor completing the initial postoperative assessment should consider the monitoring regimen and appropriate level of care required for the next 24 hours in collaboration with the nursing team.

CS: Documenting numerical data in graphical form facilitates the assessment of trends. (See example in Annex 3, from original guideline document.)

CS: Patients requiring the frequent monitoring of multiple variables should be considered for care at level 2 or above.

CS: Any patient with circulatory disturbance should be catheterised and the urine output measured hourly

CS: Consider catheterisation in patients with no urine production after four hours.

CS: Trends in the physiological data, rather than absolute numbers, should be reported to assist in the detection of deteriorating patients before a severe physiological compromise occurs.

Daily Clinical Assessment

CS: Postoperative monitoring should be continued on a daily basis

CS: The monitoring regimen should be reviewed daily so as best to provide data for clinical decision making

CS: Any change in a monitoring regimen should prompt reassessment of the level of care.

The Role of Senior Medical Staff

CS: The ultimate responsibility for patient care lies with the consultants providing surgical and anaesthetic care

CS: Junior doctors should assume only the responsibility appropriate to their training and experience

CS: Where a junior doctor feels that they may exceed their personal responsibilities or capabilities, they have a duty of care to discuss the patient with a more senior doctor in the same clinical team.

Cardiovascular Management

Blood Pressure

CS: Postoperative blood pressure should always be reviewed with reference to the preoperative and intraoperative assessments.

CS: Further assessment is required for patients with:

- Heart rate below 50 beats per minute
- Heart rate above 100 beats per minute
- Blood pressure below 100 mm Hg systolic

CS: If patients are hypertensive, ensure that they are receiving adequate analgesia. If hypertension persists, seek specialist medical advice and review the level of care.

CS: Patients on regular antihypertensive medication should normally be maintained on this medication perioperatively. If the patient becomes hypotensive, then it may be appropriate to discontinue some drugs.

C: Beta blockers and intravenous (IV) nitrates may be used safely and effectively in postoperative hypertension.

Myocardial Ischaemia

CS: Clinicians caring for patients postoperatively must be aware of clinical factors which increase risk to the patient and how these interact with the risks imposed by the surgical procedure.

Medical Treatment to Reduce Perioperative Cardiac Risk

CS: Clinicians caring for patients postoperatively must be aware of potential optimisation strategies instituted preoperatively that should be continued into the postoperative period.

B: Beta blockers should be continued perioperatively in patients previously taking these drugs for coronary disease, congestive heart failure, hypertension, or arrhythmias.

Arrhythmias and Conduction Defects

CS: Seek expert help early in the management of serious or potentially serious arrhythmias and reconsider the level of care.

CS: The occurrence of supraventricular arrhythmias should provoke a search for underlying causes such as hypoxia, hypovolaemia, electrolyte abnormality, sepsis, or drug toxicity.

CS: Direct current (DC) shock should be considered as a first treatment option where there is haemodynamic deterioration as a result of a tachyarrhythmia.

Conduction Defects

CS: Seek expert help early when perioperative conduction defects result in bradycardia unresponsive to atropine.

Perioperative Myocardial Infarction

CS: Where perioperative myocardial infarction (MI) is diagnosed or suspected, early specialist medical advice should be sought.

CS: Patients with high clinical risk of perioperative MI undergoing high or intermediate-risk procedures should have:

- Electrocardiogram (ECG) at baseline, immediately following surgery, and daily for the two subsequent days
- Cardiac troponin measurements 24 hours after surgery

CS: In patients without documented coronary disease, surveillance for perioperative MI should be restricted to those who develop cardiac symptoms or signs.

CS: Thrombolysis is not indicated in the management of perioperative MI, but all other aspects are as for MI in any other setting.

Hypothermia

CS: Maintain normothermia in the postoperative period.

CS: Active warming is appropriate for patients who are hypothermic postoperatively.

Oxygenation

CS: Patients with coronary artery disease, or major risk factors for coronary artery disease, should receive oxygen continuously until mobile.

CS: Oxygen saturation should be maintained above 92%.

Respiratory Management

Reducing Postoperative Pulmonary Complications

CS: Oxygen therapy should be used in those patients at high risk of postoperative complications, or who are hypoxaemic following surgery (oxygen saturation measured by a pulse oximeter [SpO_2] <92%).

Monitoring and Diagnosis

CS: Respiratory rate, pulse rate, and conscious level should be monitored routinely to identify postoperative respiratory complications.

CS: The following indicate the possible development of respiratory complications:

- Respiratory rate <10 or >25 breaths per minute
- Pulse rate >100 beats per minute
- Reduced conscious level

CS: Patients in whom there is a suspicion of postoperative pulmonary complications should have an arterial blood gas analysis, a sputum culture, and ECG.

CS: Chest x-ray should be performed on suspicion of major collapse, effusions, pneumothorax, or haemothorax.

CS: Other investigations should be used only if there are specific indications.

Treatment

CS: Oxygen should be given to patients with hypoxaemia using a device that is best tolerated to achieve the necessary SpO_2. In normally hydrated patients humidification is unnecessary. Failure to maintain an SpO_2 >90% or arterial

oxygen partial pressure (PaO_2) >8.0 kPa is an indication to consider assisted ventilation.

CS: Patients with evidence of respiratory infection should receive antibiotics based initially on local protocols and modified later on the basis of the results from sputum culture. If aspiration of intestinal contents is suspected, additional cover for anaerobic organisms should be given.

CS: Opioid overdose should be treated with oxygen, airway maintenance, ventilatory support if necessary, and immediate anaesthetic or critical care specialist advice.

CS: Benzodiazepine overdose should be treated with oxygen, airway maintenance, ventilatory support if necessary, and immediate specialist advice.

CS: Hypoventilation due to central nervous system (CNS) depression not responsive to specific antagonists is an indication for specialist anaesthetic or critical care referral.

CS: Patients developing respiratory failure should be referred to a critical care specialist to be assessed for possible assisted ventilation. The referral should be timely, as hypoxia or hypercapnia may lead rapidly to cardiorespiratory arrest.

Role of Physiotherapy

CS: The patient should be encouraged to sit up and should be given sufficient analgesia, which may include epidural anaesthesia, to allow breathing exercise and coughing.

CS: Patients with sputum retention should be assessed by a physiotherapist.

CS: Patients with collapse or decreased lung volume or who have undergone recent thoracic or abdominal surgery should be considered for physiotherapy.

Fluid, Electrolyte, and Renal Management

CS: The basal requirements for young adults are approximately 30 mL/kg/day of water, 1.0 to 1.4 mmol/kg/day of sodium, and 0.7 to 0.9 mmol/kg/day of potassium.

CS: Invasive monitoring should be considered to assess fluid balance status, particularly in high-risk patients.

CS: Elderly patients should be observed closely as they are more likely to have overt or covert cardiac, respiratory, or renal disease and to have less reserve. Clinical signs may be less reliable in these patients.

Prophylaxis

CS: Be aware that preoperative bowel preparation or prolonged preoperative fasting may result in covert hypovolaemia, which may become evident only in the early postoperative period.

CS: Assess hypotensive patients with epidurals to exclude fluid deficit. It should not be assumed that the hypotension is due to the epidural.

CS: Avoid excessive administration of fluids to hypotensive patients with epidural anaesthesia who are well perfused. This can cause fluid overload which may only become manifest when the epidural infusion is stopped.

Detection of Overt Clinical Problems

CS: Accurate assessment of fluid and electrolyte status can be difficult and the treatment of a particular patient must be individualised and reviewed frequently in the light of the response to treatment.

Management of Volume Depletion and Overload

CS: Volume depletion should be avoided as this can lead to poor perfusion and problems such as anastomotic breakdown, cerebral damage, renal failure, and multiple organ failure.

CS: Volume overload should be avoided.

Oliguria

CS: Oliguria is defined as urine volume of less than 0.5 mL/kg/hr for two consecutive hours. The appropriate response depends on the cause and whether there is pre-existing renal impairment.

CS: Oliguria in an alert patient that is associated with normal pre-existing renal function and cardiovascular stability, is unlikely to require intervention unless it persists for four hours or more.

CS: If oliguria is associated with other symptoms or signs suggestive of fluid depletion, it should be treated initially with a fluid challenge.

CS: In all cases of oliguria it is important to exclude obstruction of the urinary tract or urinary catheter.

CS: Diuretics should not be used to treat oliguria and should be reserved for fluid overload.

CS: Dopamine should not be used to treat oliguria or to prevent renal failure.

Sodium

CS: Assess volume status in hyponatraemic patients, as it is more commonly due to excess water rather than sodium deficiency.

CS: Severe hyponatraemia (Na <120 mmol/L) constitutes a medical emergency and should be managed by experienced medical staff.

CS: Hypernatraemia most commonly indicates a total body deficiency of water and is an indication for prompt assessment and intervention, especially when levels exceed 155 mmol/L.

Potassium

CS: Hypokalaemia is a common problem and can delay postoperative recovery. Hypokalaemia should be avoided, or corrected, with appropriate supplementation. Magnesium supplementation may also be required.

CS: Hyperkalaemia is a medical emergency and senior help should be obtained.

Acid/Base Balance

CS: Metabolic acidosis is usually due to poor tissue perfusion but can also be caused by excessive administration of saline. A total venous bicarbonate of less than 20 mmol/L or a base deficit of greater than 4 mmol/L may indicate cause for concern, particularly if the trend is towards progressive acidosis. Expert opinion should be sought.

Management of Sepsis

Prophylaxis

CS: Prophylactic antibiotics should be administered to appropriate groups of patients to reduce the risk of developing postoperative sepsis.

CS: Hand washing with soap and water or with alcoholic cleansing agents should be performed before and after patient contact.

CS: Strict hand antisepsis must be achieved before the performance of invasive procedures such as surgery or the placement of intravascular catheters, indwelling urinary catheters, or other invasive devices.

CS: Gloves should be used for hand-contaminating activities.

CS: Gloves made from a range of materials should be available for personnel with sensitivity to standard glove material, and for use in patients with a similar sensitivity.

Early Identification

CS: Early identification and appropriate treatment of sepsis improves outcome.

CS: Urine and blood cultures should be obtained whenever there is reason to suspect systemic sepsis.

CS: If clinical signs are unclear, appropriate radiological investigations should be used for the diagnosis of intra-abdominal infection.

Management

CS: If the cause of sepsis is unknown, treatment should be with broad spectrum antibiotics, guided by local protocols.

CS: The results from microbiological specimens should be reviewed regularly and antibiotics changed as necessary.

CS: A course of antimicrobial treatment should generally be limited to 5 to 7 days. It is important to appreciate that fungi and atypical organisms can contribute to sepsis syndrome, and to take cultures and prescribe appropriately.

CS: Surgical intervention in the form of debridement or drainage of infected, devitalised tissue should be undertaken as soon as possible following haemodynamic stabilisation.

CS: Percutaneous drainage following radiological identification should be considered for well defined collections.

CS: Patients with multiple collections or with failure of percutaneous drainage should have open surgery.

Postoperative Nutrition

Avoiding Routine Nasogastric Intubation

CS: Oral intake should be commenced as soon as possible after surgery.

CS: Patients should not be fasted for any longer than necessary, either for investigations or surgery.

CS: Hospitals should provide appetising food and assist patients to eat, if this is needed.

CS: Anti-emetics should be used as required in order to promote an early return of oral intake.

Nutritional Support for Malnourished Patients

CS: Malnourished patients with benign disease requiring surgery should receive postoperative nutritional support by the appropriate route.

CS: Mild or moderately malnourished cancer patients should proceed with surgery and only receive artificial nutritional support if specifically indicated.

CS: All malnourished cancer patients should be considered for nutritional advice and oral supplements in the postoperative period and for a period following discharge.

Artificial Nutritional Support

CS: Nutritional replacement should be discussed with a dietitian and tailored to the patient's requirements.

CS: Enteral nutrition is the preferred method of postoperative nutritional support and should be used if possible.

CS: For patients with ongoing postoperative complications, enteral nutrition should be used whenever possible, combined with parenteral nutrition where necessary, to meet nutritional needs.

Artificial Nutritional Techniques

CS: Enteral nutrition should be provided by the simplest technique possible. The feeding should be given in such a way as to interfere minimally with the normal stimuli to eating.

CS: Parenteral nutrition should be provided through a dedicated intravenous catheter.

CS: Nutritional and metabolic status should be assessed regularly and the nutritional prescription modified as necessary.

CS: Quality of nutritional support is enhanced by the use of dedicated nutrition teams.

Definitions:

Grades of Recommendation

Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

A: At least one meta-analysis, systematic review of randomised controlled trials (RCTs), or RCT rated as 1++ and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results.

B: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1++ or 1+.

C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 2++.

D: Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+.

Levels of Evidence

1++: High quality meta-analyses, systematic reviews of randomized clinical trials, or randomized clinical trials with a very low risk of bias

1+: Well-conducted meta-analyses, systematic reviews, or randomized clinical trials with a low risk of bias

1-: Meta-analyses, systematic reviews, or randomized clinical trials with a high risk of bias

2++: High quality systematic reviews of case control or cohort or studies

High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

2+: Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal

3: Non-analytic studies (e.g. case reports, case series)

4: Expert opinion

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Most of the recommendations were developed from structured discussion, informed by any existing evidence and the development group's clinical experience, and validated using a formal scoring system. The type of supporting evidence is identified and graded for evidence-based recommendations (see "Major Recommendations"). The specific type of supporting evidence is explicitly identified in each section of the guideline.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Improved postoperative care and management of adult patients

POTENTIAL HARMS

Pharmacological Management of Arrhythmias

- Verapamil hydrochloride and beta-blockers should not be used concurrently because of the risk of severe hypotension and asystole.
- Inappropriate of ineffective drug treatment of ventricular tachycardia may worsen the situation.

Fluid, Electrolyte and Renal Management

- Over-vigorous correction of severe hyponatraemia is dangerous.

Postoperative Nutrition

- Use of early oral or artificial enteral nutrition at a time when gastrointestinal function has not returned to a suitable level can be associated with abdominal distension, vomiting, and respiratory embarrassment.

CONTRAINDICATIONS

CONTRAINDICATIONS

- For management of postoperative arrhythmias, class 1c drugs such as flecainide acetate and propafenone hydrochloride have potentially serious adverse effects and should be avoided, particularly in patients with cardiac disease.
- Contraindications to gastrostomy include sepsis, ascites and clotting disorders.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- This guideline is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made by the appropriate healthcare professional(s) in light of the

clinical data presented by the patient and the diagnostic and treatment options available. It is advised however that significant departures from the national guideline or any local guidelines derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.

- The guideline is not intended to supplant specialist medical care but to help inexperienced clinicians differentiate between those patients who are recovering normally and those in whom there is cause for concern. The distinction between the two is often difficult and the guideline emphasises early referral for senior or specialist advice where there is any doubt.
- The guideline concentrates on the postoperative period and does not address concepts such as optimisation or protective strategies instituted preoperatively. The development group recognises that the postoperative period is only one part of the journey of care but, as reported by the Scottish Audit of Surgical Mortality (SASM), this is perceived to be an area where the need for guidance is paramount.
- Much has been said about the "Golden Hour" after trauma when decisions taken can have a significant effect on outcome. There may well be a "Platinum 24 Hours" after surgery when patients are particularly vulnerable and where decision making has similar importance. This guideline is designed to assist trainee staff in making decisions even if that decision is to call for advice. The guideline development group recommends that surgical units develop protocols that make it clear when it is time to call for advice.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Patient Resources
Quick Reference Guides/Physician Guides

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness
Safety
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Scottish Intercollegiate Guidelines Network (SIGN). Postoperative management in adults. A practical guide to postoperative care for clinical staff. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2004 Aug. 56 p. (SIGN publication; no. 77). [132 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2004 Aug

GUIDELINE DEVELOPER(S)

Scottish Intercollegiate Guidelines Network - National Government Agency [Non-U.S.]

SOURCE(S) OF FUNDING

Scottish Executive Health Department

GUIDELINE COMMITTEE

Not stated

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

All members of the Scottish Intercollegiate Guidelines Network (SIGN) guideline development groups are required to complete a declaration of interests, both personal and non-personal. A personal interest involves payment to the individual concerned (e.g., consultancies or other fee-paid work commissioned by or shareholdings in the pharmaceutical industry); a non-personal interest involves payment which benefits any group, unit, or department for which the individual is responsible (e.g., endowed fellowships or other pharmaceutical industry support). Details of the declarations of interest of any guideline development group member(s) are available from the SIGN executive.

GUIDELINE STATUS

This is the current release of the guideline.

Any amendments to the guideline in the interim period will be noted on Scottish Intercollegiate Guidelines Network (SIGN) Web site.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the Scottish Intercollegiate Guidelines Network (SIGN) Web site.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Quick reference guide: Postoperative management in adults. Scottish Intercollegiate Guidelines Network, 2004 Aug. 2 p. Available in Portable Document Format (PDF) from the Scottish Intercollegiate Guidelines Network (SIGN) Web site.
- SIGN 50: A guideline developer's handbook. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network. (SIGN publication; no. 50). Available from the SIGN Web site.
- Appraising the quality of clinical guidelines. The SIGN guide to the AGREE (Appraisal of Guidelines Research & Evaluation) guideline appraisal instrument. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network, 2001. Available from the SIGN Web site.

PATIENT RESOURCES

The following is available:

- Information for discussion with patients and carers. In: Postoperative management in adults. A practical guide to postoperative care for clinical staff. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2004 Aug. p 44. (SIGN publication; no. 77).

Electronic copies: Available in Portable Document Format (PDF) from the Scottish Intercollegiate Guidelines Network (SIGN) Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC STATUS

This NGC summary was completed by ECRI on October 8, 2004. The information was verified by the guideline developer on January 26, 2005.

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