TITLE: Intravenous Fluid Therapy During Post-Surgical Recovery: Clinical Evidence for Discontinuation and Guidelines

DATE: 19 November 2008

RESEARCH QUESTIONS:

1. Is there evidence supporting early discontinuation of intravenous fluid therapy during post-surgical recovery in patients who are hemodynamically stable?

2. What are the guidelines for intravenous fluid maintenance following routine surgical procedures in patients who are hemodynamically stable?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 4, 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. Results include articles published between 2003 and October 2008, and are limited to English language publications only. No filters were applied to limit the retrieval by study type. Internet links are provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

RESULTS:

HTIS reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented...
first. These are followed by randomized controlled trials, controlled clinical trials, observational studies, and evidence-based guidelines.

The literature search identified three randomized controlled trials (RCTs) and two observational studies. These studies did not specifically examine early discontinuation of intravenous (IV) fluid therapy, but assessed IV fluid restriction during post-surgical recovery. One guideline pertaining to post-operative fluid management in children was also identified. No health technology assessments, systematic reviews, meta-analyses, or controlled clinical trials were identified through the literature search. Additional references of potential interest are included in the appendix. Most of the articles in the appendix discuss perioperative fluid administration, but it is not clear if this includes the post-surgical period, so they were not included in the main report.

OVERALL SUMMARY OF FINDINGS:

Three RCTs were identified. Two of these trials examined the effects of intravenous fluid restriction on postoperative colorectal surgery recovery and the other assessed the effect of post-operative hydration on clinical outcomes after adenotonsillectomy.

MacKay et al. (2006)\(^1\) randomized 80 patients to either restricted fluids (<2 litres of water and 77 mmol of sodium for 24 hours post-surgery) or standard fluid regimen (3 litres of water and 154 mmol of sodium per day, for as long as necessary). On average, the restricted group received about one-half the amount of intravenous fluid (4.50 litres) as the standard group (8.75 litres). There was no difference between the two groups in median time to first flatus, first bowel motion, or median hospital stay. Adverse effects were not reported. The authors concluded that postoperative IV fluid restriction following colorectal surgery does not reduce hospital stay.

Brandstrup et al. (2003)\(^3\) conducted a multicentre, randomized trial of 172 patients undergoing colorectal resection. Patients were allocated to either a restricted or standard intraoperative and postoperative IV fluid regimen. The restricted regimen was intended to maintain preoperative body weight in order to reduce complications after colorectal surgery. Details regarding the administration of each regimen were not specified in the abstract. The restricted regimen significantly reduced postoperative complications, including cardiopulmonary and tissue-healing complications. There were no deaths in the restricted group compared with four deaths in the standard group. The authors concluded that restricting perioperative fluids reduces complications following elective colorectal resection.

Egeli et al. (2004)\(^2\) conducted an RCT on pediatric patients undergoing adenotonsillectomy (number of patients not specified). One group of patients received 24 hour IV hydration (details of administration were not specified) during their hospitalization, while the other group did not receive IV hydration. Postoperatively, there were no statistical differences between the groups for nausea, fever, vomiting, odor, bleeding, otalgia, and trismus. However, the hydration group experienced a significant (p<0.05) pain-relieving effect after the second day. No adverse effects were noted with IV hydration. The authors concluded that, although 24 hour IV hydration can reduce postoperative pain in children undergoing adenotonsillectomy, it does not appear to significantly affect other clinical outcomes.

Two observational studies were identified. Koch et al. (2006)\(^4\) studied the incidence of and risk factors for developing postoperative urinary retention following endoscopic hernia repair in 153 patients of a single surgeon. Thirty-four (22.2%) of the patients developed urinary retention,
which the authors state was significantly associated with the use of narcotic analgesia and the volume of postoperative IV fluid administered (volume of fluid not specified).

Walsh et al. (2005)\textsuperscript{5} collected data from 71 patients receiving postoperative IV fluid therapy (total of 173 patient days). No details are given regarding the amount of fluid received or length of therapy time. Results showed that 17% of patients developed significant fluid-associated morbidity. Seven patients developed tachyarrhythmia (due to inadequate maintenance of potassium levels) and five patients developed fluid overload (due to excessive fluid volume and sodium administration). The authors concluded that fluid prescribing protocols could improve clinical outcomes. The abstract does not specify recommended protocols.

A consensus guideline developed by the Association of Pediatric Anesthetists of Great Britain and Ireland (2007)\textsuperscript{6} on perioperative fluid management in children was identified. One of the guideline aims was “to provide recommendations for IV fluid management during and after surgery in children of all ages.”\textsuperscript{6} Section 7 of the guideline, Post Operative Fluid Management, does not recommend a specific length of time or volume for fluid replacement. The guideline states that no consensus was reached on the maintenance fluid rate in the postoperative period. Some participants felt the full rate, as calculated using Holliday and Segar’s formula,* should be used. Other members felt that fluid replacement should be restricted to 60-70% of the full maintenance, with additional boluses of isotonic fluid given as required. Consensus was reached on replacing ongoing fluid losses from drains or nasogastric tubes every two to four hours, depending on the amount. It was also recommended that IV fluids should be discontinued when oral intake approximated the hourly maintenance rate.

\*Holliday and Segar formula:

<table>
<thead>
<tr>
<th>Body weight</th>
<th>Daily fluid requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 kg</td>
<td>4 mL/kg/hr</td>
</tr>
<tr>
<td>10-20 kg</td>
<td>40 mL/hr + 2 mL/kg/hr above 10 kg</td>
</tr>
<tr>
<td>&gt;20 kg</td>
<td>60 mL/hr + 1 mL/kg/hr above 20 kg</td>
</tr>
</tbody>
</table>

In summary, there is conflicting evidence on the effect of restricted IV fluid therapy post-surgery. None of the articles specifically addressed early discontinuation of fluid therapy.

One RCT of colorectal surgery patients stated that restriction of postoperative IV fluid and sodium did not reduce the length of hospital stay. The other RCT of colorectal surgical patients concluded that restriction of intraoperative and postoperative IV fluids, by maintaining unchanged body weight, reduced post-surgical complications. The RCT of pediatric patients undergoing adenotonsillectomy showed that, although postoperative 24 hour IV hydration reduced postoperative pain, it did not improve other clinical outcomes.

One observational study on post-endoscopic hernia repair indicated that postoperative urinary retention was correlated with increased postoperative IV fluid volume, which indicates that restricting IV fluids may be beneficial. The second observational study did not provide specific details on postoperative IV fluid therapy, but stated that practice could be improved by introducing fluid prescribing protocols.

The APA consensus guideline did not reach consensus on postoperative IV fluid rate, but did recommend that fluid losses from drains or nasogastric tubes should be measured and replaced.
every two to four hours, and that IV fluids should be discontinued when oral intake approximated the hourly maintenance rate.
REFERENCES SUMMARIZED:

Health technology assessments
No literature identified.

Systematic reviews and meta-analyses
No literature identified

Randomized controlled trials


Controlled clinical trials
No literature identified

Observational studies


Guidelines and recommendations

PREPARED BY:
Karen Cimon, Research Assistant
Jessie Cunningham, MIST, Information Specialist

Health Technology Inquiry Service
Email: htis@cadth.ca
Tel: 1-866-898-8439
APPENDIX – FURTHER INFORMATION:

Randomized controlled trials


Review articles


Additional references