Reducing peritoneal catheter-related infections

Systematic review of the effectiveness of preventing and treating *Staphylococcus aureus* carriage in reducing peritoneal catheter-related infections

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Executive summary

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Executive summary

Objectives

The objectives of this review were to determine the clinical effectiveness and cost-effectiveness of alternative strategies for the prevention and eradication of *Staphylococcus aureus* carriage in patients on peritoneal dialysis (PD). The aim was to prevent, or reduce, the frequency of peritonitis. The review does not cover treatment of peritonitis itself.

Background and intervention

In chronic renal failure, dialysis is used to replace the kidneys' function in removing impurities and unwanted products of metabolism from the blood. Peritoneal dialysis is a form of ambulatory dialysis in which fluid is fed into the abdominal cavity via a catheter through the abdominal wall. The fluid collects the substances normally excreted by the kidney. After an interval the fluid is drained out again.

The main complication of peritoneal dialysis in the short term is infection of the peritoneal cavity, peritonitis. In the longer term, recurrent episodes of peritonitis can impair diffusion across the peritoneal membrane, so that peritoneal dialysis is no longer feasible, which means that patients have to attend hospital for haemodialysis, usually three times per week.

One of the organisms which cause peritonitis is *Staphylococcus aureus*. It can colonise parts of the body without symptoms, but may cause infection where the peritoneal catheter passes through the skin of the abdomen. These are known as exit-site infections. It may also contaminate the tip of the catheter. In both situations, peritonitis may be a consequence.

Various measures have been used to try to prevent or eradicate colonisation, in the hope that this will prevent, or reduce, the frequency of peritonitis. These include antiseptics and antibiotics. The antibiotics can be applied locally or given systemically, by mouth.

S. aureus can develop resistance to commonly used antibiotics, and is then known as methicillin-resistant *Staphylococcus aureus* (MRSA).

Epidemiology

End-stage renal failure can be a consequence of a number of diseases, the commonest being glomerulonephritis, diabetes, renal vascular disease, pyelonephritis and polycystic kidney disease.

Methods

Electronic searches were undertaken to identify published and unpublished reports of randomised controlled trials (RCTs) and systematic reviews evaluating the effectiveness of preventing and treating *S. aureus* carriage on peritoneal catheter-related infections. The main databases searched were MEDLINE (1966–2005), EMBASE (1980–2005), CINAHL (1982–2005), BIOSIS (1985–2005), Science Citation Index (SCI) (1980–2005), MEDLINE Extra (6 January 2006), Cochrane Library (Issue 4 2005), Database of Abstracts of Reviews of Effectiveness (December 2005) and HTA Database (December 2005). The quality of the included studies was assessed and data synthesised. Where data were not sufficient for formal meta-analysis, a qualitative narrative review looking for consistency between studies was performed.

Results

Number and quality of studies and summary of benefits

Twenty-two trials were found. These fell into several groups: the first split is between prophylactic trials, aiming to prevent carriage, and trials which aimed to eradicate carriage in those who already had it; the second split is between antiseptics and antibiotics; and the third split is between those that included patients having the catheter inserted before dialysis started and people already on dialysis. Many of the trials were small or short-term. The quality was often not good by today's standards. The body of evidence suggested a reduction in exit-site infections but this did not seem to lead to a significant reduction in peritonitis, although to some extent this reflected insufficient power in the studies and a low incidence of peritonitis in them.

Costs

The costs of interventions to prevent or treat *S. aureus* carriage are relatively modest. For example, the annual cost of antibiotic treatment of *S. aureus* carriage per identified carrier of *S. aureus* was estimated at £179 (£73 screening and £106 cost of antibiotic). However, without better data on the effectiveness of the interventions, it is not clear whether such costs are offset by the cost of treating infections and averting changes from peritoneal dialysis to haemodialysis.

Cost-effectiveness

Although treatment is not expensive, the lack of convincing evidence of clinical effectiveness made cost-effectiveness analysis unrewarding at present. However, consideration was given to the factors needed in a hypothetical model describing patient pathways from methods to prevent *S. aureus* carriage, its detection and treatment and the detection and treatment of the consequences of *S. aureus* (e.g. catheter infections and peritonitis). Had data been available, the model would have compared the cost-effectiveness of alternative interventions from the perspective of the UK NHS, but as such it helped identify what future research would be needed to fill the gaps.

Conclusions

The importance of peritonitis is not in doubt. It is the main cause of people having to switch from peritoneal dialysis to haemodialysis, which leads to reduced quality of life for patients and increased costs to the NHS. Unfortunately, the present evidence base for the prevention of peritonitis is disappointing; it suggests that the interventions reduce exit-site infections but not peritonitis, although this may be due to trials being in too small numbers for too short periods.

Recommendations for research

The study identified key research questions that need to be addressed. These are given below.

- What is the natural history of carriage of *S. aureus*? What are the links between carriage and exit-site infection, and between exit-site infection and peritonitis? What factors predict carriage?
- Is the problem mainly with MRSA, with methicillin-sensitive *Staphylococcus aureus* (MSSA) being relatively harmless?
- Does decolonisation work, or is recolonisation rapid?
- Apart from antibiotic and antiseptic use, what other options for reducing peritonitis are there? Would more training help?
- Should measures to eradicate carriage be intermittent or chronic; antiseptics versus antibiotics?
- Is vaccination worth revisiting?
- Given the common use of mupirocin in renal units, research into that drug and resistance to it should be a priority.

Trials are needed with larger numbers of patients for longer durations.

Publication

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NIHR Health Technology Assessment Programme

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The research reported in this monograph was commissioned by the HTA Programme as project number 05/29/01. The contractual start date was in September 2005. The draft report began editorial review in May 2006 and was accepted for publication in February 2007. As the funder, by devising a commissioning brief, the HTA Programme specified the research question and study design. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' report and would like to thank the referees for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

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