Inpatient general medicine is evidence based

Jonathan Ellis, Ian Mulligan, James Rowe, David L Sackett, on behalf of the A-Team, Nuffield Department of Clinical Medicine*

Summary
For many years clinicians have had to cope with the accusation that only 10–20% of the treatments they provide have any scientific foundation. Their interventions, in other words, are seldom “evidence based”. Is the profession guilty as charged?

In April, 1995, a general medical team at a university-affiliated district hospital in Oxford, UK, studied the treatments given to all 109 patients managed during that month on whom a diagnosis had been reached. Medical sources (including databases) were then searched for randomised controlled trial (RCT) evidence that the treatments were effective. The 109 primary treatments were then classified: 82% were evidence based (ie, there was RCT support [53%] or unanimity on the team about the existence of convincing non-experimental evidence [29%]).

This study, which needs to be repeated in other clinical settings and for other disciplines, suggests that earlier pessimism over the extent to which evidence-based medicine is already practised is misplaced.

Lancet 1995; 346: 407–10

Introduction
Commentators on the scientific basis for medical care lament the paucity of solid evidence for most medical interventions.1 Summarising the state of affairs in 1991 the editor of the British Medical Journal noted that a health care conference in Manchester, UK, had been told that “only about 15% of medical interventions are supported by solid scientific evidence”. Such laments are not new. In 1861, Oliver Wendell Holmes wrote: “I firmly believe that if the whole materia medica, as used now, could be sunk to the bottom of the sea, it would be all the better for mankind—and all the worse for the fishes”.3 Despite advances in knowledge of human biology and health care these gloomy characterisations have continued to the present day. In 1992, in a personal communication to lain Chalmers (a leading light in the Cochrane Collaboration) the distinguished epidemiologist Kerr White reported having suggested in 1976 that “only about 15–20% of physicians’ interventions were supported by objective evidence that they did more good than harm”. White had been speaking in Wellington, New Zealand, and was interrupted in mid-sentence by Archie Cochrane, who called out: “Kerr, you’re a damned liar, you know it isn’t more than 10%”. Two years later, an estimate that “only 10 to 20% of all procedures currently used in medical practice have been shown to be efficacious by controlled trial” was published by the Office of Technology Assessment of the US Congress,4 a charge OTA repeated in 1983. In between these two reports, Williamson examined common medical practices for three subspecialties of internal medicine and concluded that fewer than 10% had any foundation in published research.5 More recently Dubinsky and Ferguson reviewed 126 therapeutic and diagnostic technologies assessed by the US National Institutes of Health and concluded that only 21% were firmly based on research-generated scientific evidence.6 The accusation was emboldened in the United States in 1993, when one radio chat-show host opined that since only 10–20% of medical procedures had been shown to be effective in controlled trials, that “would put 80 to 90% of accepted medical procedures in this country under the heading of quackery”.

As both a general physician and an advocate of evidence-based medicine one of us (DLS) was sceptical about the validity of these gloomy verdicts. First, because they tended to focus on high-profile, and expensive, procedures, the pronouncements risked ignoring low-profile, low-technology interventions. Second, because these pessimistic assessments used clinical manoeuvres rather than patients as the denominator for their rates, treatments that were rarely used received the same weight as common ones. Third, access to evidence from randomised trials is hampered by the fact that up to half such trials are not indexed as such in databases like MEDLINE.7

DLS’ own clinical experience suggested that the situation at the bedside was not as depressing as described in the literature so, for all these reasons, when he started on the general medicine service at the John Radcliffe Hospital, Oxford, UK (a university-affiliated tertiary care and district general hospital) in April, 1995, he suggested to the other members of his clinical team that they determine the extent to which the patients they cared for during that month received evidence-based therapy. They agreed.

Methods
In the first 2 days of April a protocol was generated and initiated by the 17-strong clinical team (1 professor, 1 senior registrar, 2 registrars, 1 senior house-officer, 2 house-officers, 10 students). We included every inpatient diagnosed and treated by the team in April. At the time of the patient’s discharge or death or at the end of the month if the patient was still in hospital the team met to seek consensus on two items, the primary diagnosis and the primary intervention.

<table>
<thead>
<tr>
<th>Type of evidence</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) Evidence from randomised controlled trials</td>
<td>56 (53%)</td>
</tr>
<tr>
<td>(II) Convincing non-experimental evidence</td>
<td>22 (29%)</td>
</tr>
<tr>
<td>(III) Interventions without substantial evidence</td>
<td>19 (18%)</td>
</tr>
</tbody>
</table>

Table 1: Summary of results
The primary diagnosis was defined as the disease, syndrome, or condition entirely or, if there were several diagnoses, most responsible for the patient's admission to hospital. Characteristic symptoms, signs, and laboratory investigations were used to establish these. In the special case of pneumonitis, we required cough and sputum plus either definitive chest radiographic changes or signs of inflammation (fever, raised peripheral blood white cell count, or raised C-reactive protein). The primary intervention was the treatment or other manoeuvre that represented our most important attempt to cure, alleviate, or care for the patient in respect of his or her primary diagnosis. The primary intervention was then discussed and traced into an "instant resource book of evidence-based medicine" (maintained by DLS) or medical textbooks or published journal articles, for which purpose we used the bibliographic databases SilverPlatter (SilverPlatter Information Inc) or Knowledge Finder (ARIES Systems Corp). On the basis of the evidence unearthed in this way every primary intervention was classified as:

I. Intervention with evidence from RCTs—Interventions whose value (or non-value) had been established in one or more RCTs or overviews of RCTs;

II. Intervention with convincing non-experimental evidence—Interventions whose face validity is so great that randomised trials were unanimously judged by the team to be both unnecessary and, if a placebo would have been involved, unethical. Examples are starting the stopped hearts of victims of heart attacks and transfusing otherwise healthy individuals in haemorrhagic shock. A self-evident intervention was judged effective for the individual patient when we concluded that its omission would have done more harm than good.

III. Intervention without substantial evidence—An intervention in common use but meeting neither of the above two criteria.

Primary interventions were classified "evidence based" if they were categories I or II. Interventions that had not been validated in randomised trails were classified as "convincing non-experimental evidence" (group II) only when the team was unanimous; even if there was only one dissenting voice, that intervention was relegated to category III.

Results

During April, 1995, the team cared for 121 patients. No primary diagnosis was made for 12 (9 admitted on April 30), leaving a study sample of 109. The evidentiary basis for the interventions we offered them is summarised in table 1. 82% of patients (90/109) were judged on our criteria to have received evidence-based interventions. Table 2 shows that our selection of the primary interventions for 53% of patients was based on our interpretations of one or more RCTs. Of the 28 trials or overviews we consulted, 21 had already been summarised in the instant resource book carried by DLS (often in the form of critically appraised topics) and were examined when that treatment decision was being made. The other 7 were identified a few hours later through literature-searching by a team member—ie, they only confirmed a clinical decision already taken.

Table 3 summarises the 32 patients (29%) who received interventions unanimously judged to be based on convincing non-experimental evidence after literature searches had uncovered no randomised trials or systematic reviews. Despite this absence of experimental evidence, in none of these cases would any team member have been willing to have the patient entered into a randomised trial in which the patient might have received
we had offered them. Many of these patients had major
a placebo or other major deviation from the intervention
we placed them. Many of these patients had major
infections and were treated with antibiotics. 19 patients (18%) received specific symptomatic and
supportive care without substantial evidence that it was
superior to some other intervention, including nothing at
all (table 4).

Discussion
In this monitoring of the day-to-day operation of a busy
general medicine inpatient service at a university-affiliated
district general hospital, the overwhelming majority of
patients were offered (and accepted) evidence-based
interventions. More than half received interventions
previously shown to do more good than harm in one or
more randomised controlled trials, and another one-third
received interventions judged to be self-evidently effective
to the extent that the team members considered it
unethical to conduct a trial in which the intervention
would be withheld. These results support the view that
learning how to practise evidence-based medicine is not
just an academic exercise but can influence clinical
decisions.

Other clinicians may disagree with our classification
system and/or they way we applied it to the interventions
offered to our patients. Moreover, some “conceiving non-
experimental” interventions (table 3) may have been
subjected to randomised trials that our search missed and
deserve to be promoted to table 2 (if proved effective) or
banished from our armamentarium if proven worthless or
harmful. We would welcome learning about our errors
here. Given the repeated demonstration that other “self-
evidently” effective treatments (such as encainide for
post-myocardial infarction ventricular ectopy) are
evidently” effective treatments (such as encainide for
post-myocardial infarction ventricular ectopy) are
harmful, it could be argued that some of the interventions
in table 3 are so uncertain that randomised trials might
reveal them to be useless or even harmful. We will keep
the entries in table 3 under careful scrutiny and hope that
opportunities to test them in randomised clinical trials
will be seized so that they can either gain a place in table 2
or be abandoned. Finally, some of our primary diagnoses
may have been wrong, and many of our patients might
have recovered without the interventions we offered them
(eg, pneumonitis, which is often a difficult diagnosis to
establish in its milder forms).

On the other hand, it could be argued that we have
penalised ourselves by omitting deserving patients from
table 2. For example, non-compliant patients in whom we
re-established adherence with interventions previously
validated in randomised trials could have been upgraded
to table 2 rather than relegated, as we did, to table 3
(non-experimental). Similarly, we did not enter the
patients into table 2 when validated diagnostic tests (such
as lung scans for pulmonary embolism) demonstrated that
they did not need specific interventions previously
validated in randomised trials.

However, even in a “worst-case scenario”, in which none
of the interventions in table 3 proved to be effective,
we still provided interventions validated by controlled
trials to over 50% of patients admitted to our general
medical service, a figure far higher than the 10–20% so
often cited. Why this disparity? We suggest two reasons.
First and more important, we selected patients, not
procedures, as the focus of our attention and as the
denominator for our rates and proportions. This clinical
perspective provides the more appropriate measure of the
extent to which we are providing patients with up-to-date,
evidence-based medicine. Second, only one of the earlier,
pejorative estimates found in our literature search was
backed up by real evidence; the rest were armchair
conjecture.

We do not know how far our experience in one month
on a general medical service is generalisable. It may not
be shared by other clinical teams with other therapeutic
or educational philosophies, or in hospitals with different
referral patterns or mixes of patients. And certainly it may
not be observed in other branches of medicine. We
encourage our colleagues in these other settings to
improve on our methods and expand our limited
knowledge of the practice of evidence-based medicine.

Other members of the A-Team, Nuffield Department of Clinical
Medicine—Ben Box, Laura Burgoyne, Camille Carolli, Jo Chilwee,
Gerry Christofi, Derryl Hughes, Katie Jeffery, Rowena Jones,
Sharon Peacock, Moyra Reid, Kopal Tandon, Clare Wood-Allum, and
Sebastian Walter.

Special thanks to e-mail colleagues, notably Hellen Gelband, for helping
us complete our search for the references cited in the introduction.

References
2 Smith R. Where is the wisdom ...? the poverty of medical evidence.
3 Holmes OW. In: Strauss MB, ed. Familiar medical quotations. Boston:
4 Office of Technology Assessment of the Congress of the United States.
Assessing the efficacy and safety of medical technologies. Washington,
5 Office of Technology Assessment of the Congress of the United States.
The impact of randomised clinical trials on health policy and medical
6 Williamson JW, Goldschmidt PG, Jillson IA. Medical Practice
Information Demonstration Project: final report. Baltimore, Maryland:
7 Dubinsky M, Ferguson JH. Analysis of the National Institutes of
Health Medicare Coverage Assessment. Int J Technol Assess Health Care
8 Dickersin K, Scherer R, Lewin CB. Identifying relevant studies for
9 Lee HM, Saube JS, Farkouh ME, Sackett DL. The critically appraised
topic: a standardized aid for the presentation and storage of
10 Cairns JA, Gent M, Singer J, et al. Aspirin, sulfinpyrazone, or both in
11 RISC Group. Risk of myocardial infarction and death during treatment
with low dose aspirin and intravenous heparin in men with unstable
12 McNenahan JM, Wilson JT, Dargie HJ. Importance of ancillary
properties of beta blockers in angina: a study of sotalol and atenolol.
Br Heart J 1988; 59: 685–89.
13 Fibriolytic Therapy Trialists’ (FTT) Collaborative Group. Indications
for fibrinolytic therapy in suspected acute myocardial infarction.
14 Zulstra F, de Boer MJ, Hoornije JC, Reiffers S, Reiber JH,
Various helminthic parasites, most of which are uncommon in economically developed countries, can cause abdominal pain and eosinophilic inflammation of the bowel. A homosexual man presented with severe abdominal pain and haemorrhagic colitis, eosinophilic inflammation of the ileum and colon, and numerous unidentifiable larval nematodes in diarrhoeal stool. His symptoms resolved with anthelmintic treatment alone. Using comparative morphology and molecular cloning of nematode ribosomal RNA genes, we identified the parasites as larvae of the pinworm Enterobius vermicularis, which are rarely observed or associated with disease. Occult enterobiasis is widely prevalent and may be a cause of unexplained eosinophilic enterocolitis.

Lancet 1995; 346: 410–12

Various intestinal nematodes can cause abdominal pain and enteritis, including hookworm, and species of strongyloids, anisakids, and intestinal trichinella. These infections primarily involve the small intestine and usually cause peripheral eosinophilia due to parasitic penetration of mucosa. The dog hookworm Anclylostoma caninum is recognised as a cause of human eosinophilic enteritis. Heavy infections with the colonic whipworm Trichuris trichiura can result in a dysentery-like syndrome. Infections with the common pinworm, Enterobius vermicularis, are usually asymptomatic or cause only anal pruritis, except for occasional ectopic migration into the appendix or the female genital tract by adult pinworms.

We describe a patient with haemorrhagic eosinophilic enterocolitis associated with numerous nematode larvae, which were identified by morphological and molecular criteria as E vermicularis.

An 18-year-old man was admitted with a 3 day history of abdominal pain and melena, without vomiting or fever. He had no relevant medical history, including atopy and food allergy, did not drink alcohol excessively, and had not recently taken aspirin or other drugs. He was born and lived in Boston, did not own a dog, had never travelled abroad, and was homosexual with a single partner. He had normal vital signs, severe abdominal tenderness in the right lower quadrant, and melenic stool. His white cell count was 12.6 x 10^9/L with 77% neutrophils, 15% lymphocytes, 5% monocytes, and 3% eosinophils. Other routine haematological and blood chemistry test results were normal. HIV antibody was negative. Upper endoscopy findings were normal. Colonoscopy showed purulent discharge from the rectum to the terminal ileum, erythematous and friable mucosa, and numerous small stellate ulcerations. Six biopsy specimens, from rectum to ileum, revealed intense infiltration of the surface enterocyte layer by eosinophils, and patchy ulceration with overlying pseudomembranes composed of fibrin, neutrophils, and, especially in the lamina propria, crypts, and capillaries, many eosinophils. No biopsy sample revealed granulomas, invasive microorganisms, viral inclusions, dysplasia, or extension of inflammation below the muscularis mucosae.

Eosinophilic colitis associated with larvae of the pinworm Enterobius vermicularis

Leo X Liu, Jonathan Chi, Melissa P Upton, Lawrence R Ash


