Which ‘soft drink’ was named after a drug?
Seven-Up Settles the Stomach
For Hospital or home use.

LITHIATED LEMON SODA

The added citrates neutralize free acid. The sugar is inverted...burns clean. 7-Up is more than a mixer...it blends out the harsh features. Drapes hangovers...takes the "ouch" out of grouch.

Slenderizing

PRINTED IN U.S.A.
Topics

- Evidence Based Medicine
- Evidence
- Evidence Based Laboratory Medicine
- Measurement Uncertainty
Topics

• Evidence Based Medicine

• Evidence

• Evidence Based Laboratory Medicine

• Measurement Uncertainty
Box 1.2 Characteristics of Novice, Competent and Expert Practitioners

The novice practitioner is characterised by:
Rigid adherence to taught rules or plans
Little situational perception
No discretionary judgment

The competent practitioner:
Is able to cope with ‘crowdedness’ and pressure
Sees actions partly in terms of long-term goals or a wider conceptual framework
Follows standardised and routinised procedures

The expert practitioner:
No longer relies explicitly on rules, guidelines and maxims
Has an intuitive grasp of situations based on deep, tacit understanding
Uses analytic approaches only in novel situations or when problems occur
“Evidence-based medicine de-emphasizes intuition, unsystematic clinical experience and pathophysiological rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research.”
Five Steps of Evidence Based Medicine

Step 1 - Ask a clinical question
Step 2 - Acquire the best evidence
Step 3 - Appraise the evidence
Step 4 - Apply the evidence
Step 5 - Assess the performance

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Asking Focused Questions

One of the fundamental skills required for practising EBM is the asking of well-built clinical questions. To benefit patients and clinicians, such questions need to be both directly relevant to patients’ problems and phrased in ways that direct your search to relevant and precise answers. In practice, well-built clinical questions usually contain four elements, summarised below.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient or Problem</strong></td>
<td><strong>Intervention</strong> (a cause, prognostic factor, treatment, etc.)</td>
<td><strong>Comparison</strong> Intervention (if necessary)</td>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>Tips for Building</td>
<td>Starting with your patient, ask “How would I describe a group of patients similar to mine?” Balance precision with brevity.</td>
<td>Ask “Which main intervention am I considering?” Be specific.</td>
<td>Ask “What is the main alternative to compare with the intervention?” Again, be specific.</td>
</tr>
<tr>
<td>Example</td>
<td>“In patients with heart failure from dilated cardiomyopathy who are in sinus rhythm ...”</td>
<td>“... would adding anticoagulation with warfarin to standard heart failure therapy ...”</td>
<td>“... when compared with standard therapy alone ...”</td>
</tr>
</tbody>
</table>
Asking the right question and asking it right.

Question formulation is at the heart of guideline development.

Questions should identify the reason(s) the test is being used and whether its result will influence clinical decisions and outcomes.

A clear question is essential for locating and selecting studies and for critically appraising their validity and relevance.

In evidence-based laboratory medicine, a structured question consists of three or four parts:

(1) the patient with a problem;
(2) the diagnostic intervention;
(3) its comparison with another test or a reference standard; and
(4) the outcome.

Using two examples, we illustrate below two types of questions that can be formulated differently, depending on whether the question is related to the diagnostic accuracy or the diagnostic utility of a test.

These two questions are formulated according to the four- or three-part models indicated above:
Asking the right question and asking it correctly.

Type 1 question (regarding the diagnostic accuracy of a test):

In (1) patients presenting to the emergency department with shortness of breath,
• how well does (2) N-terminal pro-B-type natriuretic peptide
• (4) predict heart failure as assessed by
• (3) the cardiac ejection fraction measured by echocardiography?

Type 2 (related to the value of a test in improving patient outcomes):

In (1) patients admitted to the hospital for treatment of heart failure,
• how well does (2) the use of N-terminal pro-B-type natriuretic peptide as a guide to therapy
• (4) improve the length of hospital stay and the rate of subsequent readmission for heart failure?
The five step EBM process can broadly be categorized as:

1. Translation of uncertainty to an **answerable question** and includes critical questioning, study design and levels of evidence

2. Systematic retrieval of the **best evidence** available

3. Critical appraisal of evidence for **internal validity** that can be broken down into aspects regarding:
   I. Systematic errors as a result of **selection bias**, information bias and confounding
   II. Quantitative aspects of diagnosis and treatment
   III. The effect **size** and aspects regarding its precision
   IV. Clinical importance of results
   V. External validity or generalizability

4. Application of results in practice

5. Evaluation of performance
Much harder is the inductive art of differential diagnosis: specifying the likelihood of different diseases on the basis of a patient’s signs, symptoms, and laboratory results.
Topics

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In the case of randomized controlled trials, the quality of evidence is high, but can be downgraded in five different domains.

- **Risk of bias**: Is a judgement made on the basis of the chance that bias in included studies has influenced the estimate of effect.
- **Imprecision**: Is a judgement made on the basis of the chance that the observed estimate of effect could change completely.
- **Indirectness**: Is a judgement made on the basis of the differences in characteristics of how the study was conducted and how the results are actually going to be applied.
- **Inconsistency**: Is a judgement made on the basis of the variability of results across the included studies.
- **Publication bias**: Is a judgement made on the basis of the question whether all the research evidence has been taken to account.
Second trimester serum tests for Down's Syndrome screening

Cochrane Systematic Review - Diagnostic | Version published: 13 June 2012

S Kate Alldred | Jonathan J Deeks | Boliang Guo | James P Neilson | Zarko Alfirevic

View authors' declarations of interest

Abstract

Background

Down’s syndrome occurs when a person has three copies of chromosome 21 - or the specific area of chromosome 21 implicated in causing Down’s syndrome - rather than two. It is the commonest congenital cause of mental retardation. Noninvasive screening based on biochemical analysis of maternal serum or urine, or fetal ultrasound measurements, allows estimates of the
<table>
<thead>
<tr>
<th>Table 1. Characteristics of a well-written abstract.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stands on its own without need to read the paper</td>
</tr>
<tr>
<td>States the hypothesis, question, or objective of</td>
</tr>
<tr>
<td>the study</td>
</tr>
<tr>
<td>Completes the story by answering the hypothesis,</td>
</tr>
<tr>
<td>question, or objective</td>
</tr>
<tr>
<td>Contains the same key words and terms as the</td>
</tr>
<tr>
<td>title and the introduction</td>
</tr>
<tr>
<td>Follows the correct style and format</td>
</tr>
<tr>
<td>Follows the order of the main text (e.g., IMRAD)</td>
</tr>
<tr>
<td>Stays within the allowed word count</td>
</tr>
<tr>
<td>Does not contain information absent in the paper</td>
</tr>
<tr>
<td>Does not make conclusions unsupported by the</td>
</tr>
<tr>
<td>data</td>
</tr>
<tr>
<td>Limits the use of abbreviations</td>
</tr>
<tr>
<td>Does not include references</td>
</tr>
<tr>
<td>Does not cite tables or figures</td>
</tr>
</tbody>
</table>

What is an elevator talk, with writing a paper? A lecture student of the nonprofit Lig- 

tion. The board of directors, Hilton, and you are waiting the 31st floor to the lobby. 

suddenly find yourself standing. philanthropic Gates’ Foundation, you spot a small child reading a book. 

Gates notices you and asks you, “What is that? What is an elevator talk, with writing a paper? A lecture student of the nonprofit Education. The board of directors, Hilton, and you are waiting the 31st floor to the lobby. Suddenly, you find yourself standing at the entrance of the elevator. philanthropic Gates’ Foundation. As you observe, a small child is engrossed in reading a book. Gates notices your interest and inquires, “What is that? That is an elevator talk.”
Topics

- Evidence Based Medicine
- Evidence
- Evidence Based Laboratory Medicine
- Measurement Uncertainty
Evidence-Based Medicine:

Wytze P. Oosterhi

Background: Guidelines are the basis for medical decision making. Support medical decisions by clinical experts, and are typically based on a systematic approach to evidence extraction, analysis, and synthesis.

Aim: This narrative review discusses the role of evidence-based decision making, and adapts those to the field of laboratory medicine. The need for guidelines in this field is essential for improving patient care.

Summary: We present a 10-step criteria for the development of guidelines. Laboratory guidelines should be developed in a multidisciplinary team, based on critically appraised evidence, and explicit statements or opinions are not considered guidelines.

1. Selection of topic
2. Determination of target groups and establishment of a multidisciplinary guideline development team
3. Identification of the scope of the guideline and definition of outcome(s)
4. Question formulation and search for the evidence, including existing guidelines
5. Critical appraisal of guidelines and/or primary evidence
6. Formulation of guideline recommendations, synthesis of the evidence
7. Consultation, peer review, consensus conference, pilot testing
8. Presentation of the guideline
9. Dissemination, implementation
10. Monitoring, evaluation, review

Do we have level I/IV evidence for all recommendations?

Do we have consensus?

Development of consensus-based recommendations

Short, non-consensus-based statements or opinions

RCPAQAP
The Royal College of Pathologists of Australasia
Quality Assurance Programs

Clinical Chemistry 50:5
Figure 2. Illustrating the close synergies between the EBLM cycle (adapted from ref.13), commissioning and performance management (adapted from ref.36), and the process of audit (adapted from ref.2).
Evidence on the performance of a diagnostic test can be considered in a hierarchy, all of the elements of which are important to making a decision.
Demand management will involve the following:

- Reducing underutilisation of laboratory testing through greater adoption of guidelines and evidence-based medicine, to ensure patients receive appropriate and timely care,

- Managing overutilisation through reducing inappropriate or unnecessary laboratory testing,

- Participating in improving chronic care management through proper use of clinical laboratory testing, leading to improved patient compliance and fewer episodic events,

- Eliminating those laboratory tests that offer little clinical value and those which are ineffective or obsolete.
## 5 Services identified by more than one search method

<table>
<thead>
<tr>
<th>No.</th>
<th>Broad service description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Testing of patients for factor V Leiden gene mutation</td>
</tr>
<tr>
<td>2</td>
<td>Arthroscopic surgery for knee osteoarthritis*</td>
</tr>
<tr>
<td>3</td>
<td>Testing for C-reactive protein†</td>
</tr>
<tr>
<td>4</td>
<td>Use of chest x-ray for acute coronary syndrome, preoperatively, or in diagnosing respiratory infections</td>
</tr>
<tr>
<td>5</td>
<td>Chlamydia screening</td>
</tr>
<tr>
<td>6</td>
<td>Exercise electrocardiogram (ECG) for angina</td>
</tr>
<tr>
<td>7</td>
<td>Imaging in cases of low back pain*</td>
</tr>
<tr>
<td>8</td>
<td>Liver function tests</td>
</tr>
<tr>
<td>9</td>
<td>Blood, urine or plasma testing in end-stage renal disease</td>
</tr>
<tr>
<td>10</td>
<td>Radical prostatectomy</td>
</tr>
<tr>
<td>11</td>
<td>Radiotherapy for patients with metastatic spinal cord disease</td>
</tr>
<tr>
<td>12</td>
<td>Routine dilatation and curettage</td>
</tr>
<tr>
<td>13</td>
<td>Surgery for obstructive sleep apnoea</td>
</tr>
</tbody>
</table>

* Denotes services identified by all three search elements. † C-reactive protein tests for community-acquired pneumonia from two sources, for urinary tract infections in children in a third. Refer to online appendix for evidence and context (eg, specified indications) for each item.
Topics

• Evidence Based Medicine

• Evidence

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• Measurement Uncertainty

THINGS GOT TENSE FOR THE TOWNSFOLK
WHEN THE THIRD META-ANALYST GANG
RODE INTO TOWN.
Evidence versus Opinions

- Numbers
  - 70
  - 71
  - 71.2
  - 71.24

- Change in Numbers
  - 142 to 149
  - 142 to 147
  - 142 to 144

- Numbers compared
  - 150 compared to 145
  - 148 compared to 145
  - 146 compared to 145
Correspondence

Uncertainty of Measurement: What it is and What it Should Be

*Tony Badrick,¹ Robert C. Hawkins,² Susan R. Wilson³ and Peter E. Hickman.⁴
¹Sullivan Nicolaides Pathology, Taringa, Queensland 4068, Australia, ²Department of Pathology and Laboratory Medicine, Tan Tock Seng Hospital, Singapore, 308433, ³Centre for Bioinformation Science and Centre for Mathematics and its Applications, Mathematical Sciences Institute, Australian National University, Canberra, ACT 0200, Australia ⁴ANU Medical School and ACT Pathology, Canberra, ACT 0200, Australia.
*For correspondence: Dr Tony Badrick e-mail: Tony_Badrick@snp.com.au

In November 2004, “Uncertainty of Measurement in Quantitative Medical Testing: A Laboratory Implementation Guide” was published in the Clinical Biochemist Reviews.¹ In the Preface, comments were invited, and that is the purpose of this paper. Whilst most of the material in the document is logical and useful, there are elements to it that should be more widely discussed before it is adopted as an application document.
1. “Does This Change in Result Reflect a Pathological Process?”
   Reference Change Value

2. Choice of Reporting Unit Interval
   Significant Figures

3. The Problem of Using Sharply Defined Cut points
   Confidence Intervals
1. “Does This Change in Result Reflect a Pathological Process?”

Reference Change Value

Quick Facts!

Littlewood's Law, which says we experience events with a million-to-one probability approximately once per month.

RCPA QAP
The Royal College of Pathologists of Australasia
Quality Assurance Program
Mr P is a 56-year-old man who has been having serum PSA measurements annually by his GP. Mr P has a **PSA result of 4.2µg/L**; 12 months ago, the result by the same laboratory and measurement procedure was **3.8µg/L**. Different?

Answer: When the laboratory was asked, they provided the MU for PSA at a concentration of **2.9µg/L** to be **0.15µg/L** (uncertainty = 5.0%). The PSA has increased from **3.8** to **4.2**. This is **0.4/3.8 x 100 = 10.5%**

For the above example: **2.77 x 5.0% = 14%**, namely the two results should differ by >14% (>0.53µg/L) for there to be **95% confidence that they are in fact different**.

In this case, the laboratory has used its MU data in several ways to assist the referring practitioner with an interpretative comment, ‘**Taking account of measurement variability, this result is not significantly different at a confidence level of 95%**.’
Question: Is the latest PSA value significantly above the age-related clinical decision value of 4.0µg/L?

Answer: The clinical decision value of 4.0µg/L does not have a known uncertainty associated with it. The MU of the result of 5.0% = 0.21µg/L at a level of 4.2µg/L.

The lab can assist with calculating the confidence interval for the patient result, which was found to be +/- 0.4µg/L.

Thus the 95% confidence interval for the latest result = 3.8-4.4µg/L.

So the result is not significantly different to 4.0 µg/L
1. “Does This Change in Result Reflect a Pathological Process?”
   Reference Change Value

2. Choice of Reporting Unit Interval
   Significant Figures
Short communication

Over-reporting significant figures—a significant problem?

Robert C. Hawkins a,*, Tony Badrick b, Peter E. Hickman c

a Department of Pathology and Laboratory Medicine, Tan Tock Seng Hospital, 11 Jalan Tan Tock Seng, Singapore 308433, Singapore
b Sullivan Nicolaides Pathology, Taringa, Queensland 4068, Australia
c Australian National University Medical School and Department of Chemical Pathology, ACT Pathology, Garran, ACT 2605, Australia

Received 4 May 2006; received in revised form 2 June 2006; accepted 2 June 2006
Available online 10 June 2006

Abstract

Background: Excessive use of significant figures in numerical data gives a spurious impression of laboratory imprecision to clinicians. We describe reporting practices in 24 Asia-Pacific laboratories, assess whether these reporting formats and those used in the literature can be justified based on actual laboratory performance and outline how to choose the appropriate number of significant places.

Methods: Thirty-two laboratories in Asia-Pacific were surveyed as to their reporting practices for serum creatinine, ferritin, sodium and TSH. Imprecision data from the General Serum Chemistry program from the RCPA-AACB Quality Assurance Program (QAP) were used to assess whether the reporting unit magnitude implicitly suggested in Tietz, the RCPA Manual and the General Serum Chemistry program itself was justified.

Results: There was a 75% response rate to the survey, with laboratories generally reporting data using unjustifiable decimals. Unit sizes from the RCPA manual, Tietz and the RCPA-AACB QAP were not justified by the majority of laboratories in the RCPA-AACB QAP.

Conclusions: The reporting unit size used by many laboratories is not justified by present laboratory performance using a 95% probability level. A consensus on appropriate reporting unit size is needed to encourage laboratories to change their present reporting formats.

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The relationship between measurement uncertainty and reporting interval

Tony Badrick¹ and Robert C Hawkins²

Abstract
Background: Measurement uncertainty (MU) estimates can be used by clinicians in result interpretation for diagnosis and monitoring and by laboratories in assessing assay fitness for use and analytical troubleshooting. However, MU is not routinely used to assess the appropriateness of the analyte reporting interval. We describe the relationship between MU and the analyte reporting interval.

Methods and results: The reporting interval \( R \) is the smallest unit of measurement chosen for clinical reporting. When choosing the appropriate value for \( R \), it is necessary that the reference change values and expanded MU values can be meaningfully calculated. Expanded MU provides the tighter criterion for defining an upper limit for \( R \). This limit can be determined as \( R \leq k \cdot SDa/1.9 \), where SDa is the analytical standard deviation and \( k \) is the coverage factor (usually 2).

Conclusion: Using MU estimates to determine the reporting interval for quantitative laboratory results ensures that reporting practices match local analytical performance and recognizes the inherent error of the measurement process.
Using MU estimates to determine the reporting interval for quantitative laboratory results ensures reporting practices match local analytical performance and recognises the inherent error of the measurement process.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value 0.01</th>
<th>Value 0.02*</th>
<th>Value 0.03</th>
<th>Value 0.06</th>
<th>Value 0.01</th>
<th>Value 0.01</th>
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</thead>
<tbody>
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<td>L/L</td>
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<td>0.02*</td>
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<td>0.06</td>
<td>0.01</td>
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<tr>
<td>RCC</td>
<td>10^12/L</td>
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<td></td>
<td>0.03</td>
<td></td>
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<td>fL</td>
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<td></td>
<td>2.5*</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MCH</td>
<td>pg</td>
<td>0.1</td>
<td></td>
<td>0.7*</td>
<td></td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>MCHC</td>
<td>g/dL</td>
<td>1</td>
<td></td>
<td>6*</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RDW</td>
<td>%</td>
<td>0.1</td>
<td></td>
<td>0.3*</td>
<td></td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

* Based on an allowable limit of error of 5% being 2SDa.

MCH, mean cell haemoglobin; MCHC, mean cell haemoglobin concentration; MCV, mean cell volume; RCC, red cell count; RDW, red cell distribution width.

*tralasian Association of Clinical Biochemists (AACB) and RCPA Haematology Quality Assurance Program survey reports. The reporting unit size implicitly suggested in authoritative textbooks, the RCPA Manual, and the General Serum Chemistry program itself was noted. We also used published data on Australian laboratory practices. The best performing laboratories could justify their chemistry unit size for 55% of analytes while comparable figures for the 50% and 90% laboratories were 14% and 8%, respectively. Reporting unit size was justifiable for all laboratories for red cell count, >50% for haemoglobin but only the top 10% for haematocrit. Few, if any, were the details of reference intervals for full or complete blood count panels, from which reporting unit sizes were inferred. Data on reporting unit sizes for a limited number of common analytes (creatinine, ferritin, thyroid-stimulating hormone and sodium) in 24 Asia-Pacific laboratories has been previously described.¹

Contemporary authoritative reporting practice

The reporting unit size used in the reference intervals and data entry sheets (for quality assurance data entry) from the sources below were recorded:

1. Textbooks: Tietz Textbook of Clinical Chemistry⁶ and Practical Haematology by Dacie and Lewis.⁷
2. Website: RCPA Manual of Use and Interpretation of Pathology Tests
Conclusions: This paper demonstrates the importance of the influence of reporting interval on reference intervals. Using this technique can reduce the cost of determining a reference interval by identifying the maximum number of specimens required.

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Unit</th>
<th>Number in data set</th>
<th>% Outliers</th>
<th>$\chi_i$</th>
<th>$s_i$</th>
<th>Reporting interval R</th>
<th>Maximum sample size N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>mmol/L</td>
<td>3157</td>
<td>0.9</td>
<td>4.935</td>
<td>0.014</td>
<td>1</td>
<td>126</td>
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<tr>
<td>Cl</td>
<td>mmol/L</td>
<td>3119</td>
<td>1.6</td>
<td>4.647</td>
<td>0.021</td>
<td>1</td>
<td>164</td>
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<tr>
<td>MCV</td>
<td>fmol/L</td>
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<td>7.6</td>
<td>4.512</td>
<td>0.044</td>
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<tr>
<td>Protein</td>
<td>g/L</td>
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<td>2.0</td>
<td>4.270</td>
<td>0.053</td>
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<td>559</td>
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<tr>
<td>Albumin</td>
<td>g/L</td>
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<td>2.4</td>
<td>3.728</td>
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<tr>
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<td>mmol/L</td>
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<td>2.128</td>
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<tr>
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<td>U/L</td>
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<td>3.332</td>
<td>0.2337</td>
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<tr>
<td>ALT</td>
<td>U/L</td>
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<td>1.8</td>
<td>3.091</td>
<td>0.4507</td>
<td>1</td>
<td>18,171</td>
</tr>
</tbody>
</table>
1. “Does This Change in Result Reflect a Pathological Process?”

Reference Change Value

2. Choice of Reporting Unit Interval

Significant Figures

3. The Problem of Using Sharply Defined Cut points

Confidence Intervals
Figure shows the proportion of patients having annual health checks who cross a threshold for diabetes of HbA$_1c$ of 6.5%, stratified by the HbA$_1c$ of the first test.

Patients who are initially close to the threshold (with a baseline HbA$_1c$ of 6.0 to 6.4) have a high probability of crossing the threshold on subsequent testing.
This is partly as a result of the regression to the mean effect described above (which explains the large jump in the proportion crossing the threshold in the second measurement and fewer in the third and fourth measurement), but also because amongst these patients, the true value is more likely to cross the threshold.
1) Avoid the ‘ping-pong’ effect which arises from adjusting treatment in response to small changes, or from over-adjusting. This may be helped by providing appropriate nomograms or algorithms.

2) Don’t read single measurements in isolation, but interpret results from the longer-term trends and variation, preferably from a graph of results (which the laboratory might supply).

3) Don’t re-measure until there is a chance of a real change, which means either the patient’s clinical picture has changed or there has been a long enough interval for ‘drift’ beyond a threshold.

The latter interval is usually longer than clinicians’ intuition suggests, as that has been coloured by the test imprecision.

4) Encourage patients to use the same laboratory when monitoring, due to the potential for changes in measures between laboratories.
Tools to assess Evidence-Based Practice behaviour among healthcare professionals

Katrien Oude Rengerink,¹* Sandra E Zwolsman,²* Dirk T Ubbink,³ Ben W J Mol,¹ Nynke van Dijk,² Hester Vermeulen³

Abstract
Objective To identify and compare tools to assess Evidence-Based Practice (EBP) behaviour among healthcare professionals.
Design Systematic review.
Data sources MEDLINE, EMBASE, Cochrane Library, PsychInfo and CINAHL up to July 2011.
Study selection Titles, abstracts and eligible full text articles were screened by two reviewers independently.
Data extraction Relevant data were extracted by one reviewer and checked by a second reviewer. Eligibility criteria for selecting studies: original studies among all healthcare professionals that described the development or use of EBP behaviour assessment tools.
Results Of 19 310 identified articles, 172 studies were included. We identified 117 questionnaires, 10 interviews or focus groups, nine observational studies, 27 chart evaluations and nine studies used a combination of methods. Psychometric properties of the questionnaires used were reported in about half of the studies, in seven studies that assess a single EBM step and in six studies that assess a combination of EBM steps. One of these assessed all five steps of EBP.

requirements for EBM, lack of EBM skills, a pyramid hierarchy in healthcare management structure discouraging EBM, and barriers related to the available evidence.⁸ ⁹ To be able to assess whether healthcare professionals and healthcare organisations actually work evidence-based, a valid and reliable method for the assessment of EBP behaviour in clinical practice is needed.

EBP behaviour can be assessed by considering if, and at what level, individual healthcare professionals use the five EBP steps in daily practice.⁷ Alternatively, the application of evidence-based clinical manoeuvres could be assessed.¹⁰ The optimal method for evaluation of EBP behaviour is unclear. Shaneyfelt et al¹¹ reviewed tools that evaluate EBP, but they focused on evaluating the effect of teaching EBP. To evaluate EBP teaching, most often knowledge and skills were assessed, rather than impact on daily clinical practice.¹² Their review showed that the Fresno Test and the Berlin Questionnaire are valid and reliable for assessing knowledge and skills of individual trainees.¹² ¹³ But, as improvement in knowledge and skills does not automatically lead to an improvement of behaviour in practice,
Ironically, healthcare professionals often fail to implement clinical procedures that have established efficacy or fail to discard proven ineffective procedures.

A study in the USA suggests that approximately 30% of patients do not receive care in accordance with the latest scientific evidence and approximately 25% of patients receive unnecessary or potentially harmful care.
Clinicians do not like to replace familiar markers with new tests unless proven extensively to influence clinical decision making.

Despite superior diagnostic accuracy, there is little evidence that cystatin C improves clinical decision making over the use of serum creatinine.

The potential confounding effects of steroid therapy and thyroid disease and lack of data on other potential confounding variables such as malignancy.

Different reference intervals have been published for different age groups and in addition, clinical decision points for cystatin C are not well-defined. Lack of uniformity and standardisation of available commercial assay formats may be contributing to this limitation.

Contradicting results in the literature, although the majority of studies showed superior or at least equal performance of cystatin C in comparison with serum creatinine in the detection of renal impairment.

Turnaround time and cost of cystatin C measurements. At present, the convenience and low cost of serum creatinine assays have allowed this marker to remain widely used at the expense of accuracy.
## Approaches and tools of implementation

<table>
<thead>
<tr>
<th>Elements of implementation</th>
<th>Behavioural and educational</th>
<th>Organisational</th>
<th>Policy</th>
<th>Other professional and personal incentives</th>
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| **Awareness**              | - marketing and media campaign  
- educational events and materials  
- conferences, seminars | - local dissemination  
- internal training  
- reminders  
- electronic prompts  
- internet access | - public awareness campaign  
- public education | - accreditation or CME/CPD points  
- acknowledgement of performance and local ‘champions’ by peers  
- invitations to attend and present own data and experience at conferences, meetings  
- offer of increased protection against litigation |
| **Acceptance**            | - opinion leaders, key experts and ‘champions’  
- endorsement by professional bodies  
- academic detailing  
- individually tailored educational interventions  
- transparency of recommendations | - local adaptation  
- management commitment to evidence based practice  
- strategic and business plans, job descriptions | - incorporation into local or national policies or government regulation | |
| **Adoption**              | - patient information and patient education | - local care process redesign  
- staff time to develop new skills and competence  
- provision of necessary resources, facilities  
- decision-support systems linked to CPOE  
- peer review and peer assessment | - clear and consistent guidelines with graded evidence and recommendations  
- guidelines equipped with implementation guides and tools  
- funding retraining in specific skills required for implementation  
- government regulation  
- financial incentives linked to reimbursement  
- review of reimbursement policy and schedule (e.g. performance payment vs. ‘fee for service’)  
- removal of items not recommended and promotion of recommended alternatives  
- differential fees | |
| **Adherence**             | - reminders  
- feedback on performance  
- provision of alternative solutions to replace existing practice | - quality system design, quality assurance and improvement  
- performance indicators  
- clinical audit  
- personalised feedback and evaluation  
- linking budget to performance | | |

CME/CPD = Continuous Medical Education/Continuous Professional Development; CPOE = Computerised Physician Order Entry.
## Utilisation of the nine mechanisms across the item groups in this report

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SNAKE-OIL LINIMENT

RELIEVES INSTANTANEOUSLY

AND CURES
HEADACHE, NEURALGIA, TOOTHACHE, EARACHE, BACKACHE,
SWELLINGS, STRAINS, SORE CHEST, SWELLING OF THE THROAT, CONTRACTED CORDS
AND MUSCLES, STIFF JOINTS, WRENCHES, DISLOCATIONS, CUTS AND BRUISES.

It quickly takes out the Soreness and Inflammation from Corns, Bunions, Insect and Reptile Bites.

The best External Preparation for BYCICLISTS and ATHLETES. It makes the Muscles supple
and relaxes the Cords. Loosens the Joints and gives a feeling of Freshness and Vigor to the whole System.

SNAKE-OIL LINIMENT CURES ALL ACHES AND PAINS.

If you are suffering from Rheumatism, ALWAYS take LA-CAS-KA internally for the Blood and
as SNAKE-OIL LINIMENT externally. When used together we GUARANTEE A CURE in every
instance or MONEY REFUNDED.

If You Are Afflicted With DEAFNESS

Get Our Specially Prepared

PURE Rattlesnake Oil
a “healthy” cola that aided digestion.
The word ‘Pepsi’ comes from the root word dyspepsia