CONTENTS

This Issue in the Journal

3 A summary of the original articles featured in this issue

Editorial

5 Magnetic Resonance Imaging (MRI): keeping abreast of current use

Original Articles

10 Society’s expectation of the role of the doctor in New Zealand: results of a national survey
Andrew Old; Brandon Adams, Peter Foley; Harvey D White

23 Communication difficulties with limited English proficiency patients: clinician perceptions of clinical risk and patterns of use of interpreters
Ben Gray, James Stanley, Maria Stubbe, Jo Hilder

39 Improving clinician-patient communication of health risks when diagnostic test information is imprecise
John Fountain, Philip Gunby

48 Compliance and quality in administration of a Surgical Safety Checklist in a tertiary New Zealand hospital
Nicole Vogts, Jacqueline A Hannam, Alan F Merry, Simon J Mitchell

59 The financial impact of clinical task substitution between practice nurses and GPs in New Zealand primary care centres
Martin Hefford, Tom Love, Jacqueline Cumming, Mary Finlayson, Antony Raymont

Review Articles

66 Laboratory diagnosis of factitious disorder: a systematic review of tools useful in the diagnosis of Munchausen’s syndrome
Christopher A Kenedi, Kristen G Shirey, Mary Hoffa, Joseph Zanga, Jonathan C Lee, Jeremy D Harrison, Xavier A Preud’homme

82 Imaging of the thyroid gland
Amirala Khalessi, Kim-Chi Phan-Thien
Clinical Correspondence

89 Encapsulating peritoneal sclerosis—a complication of peritoneal dialysis
Caroline Chembo, Alastair Macdonald, Nicola Hay, Phillip Matheson, Grant Pidgeon, Murray Leikis

94 A cerebral mass in a patient with Churg Strauss syndrome
Nazish Ilyas, Christos Fountzilas

98 Medical image. Reversible knuckle hyperpigmentation in B12 deficiency
Vivek Kumar, Vishal Sharma

Letters

100 Use of pricing and tax interventions for protecting health: potential relevance for New Zealand of recent international developments
Nick Wilson, George Thomson, Tony Blakely

104 Is integrated academic clinical training needed in New Zealand?
Michael Keogh

100 Years Ago in the NZMJ

106 On a New Method of Treating Cleft Palate: part 2

Proceedings

107 Proceedings of the 208th Scientific Meeting of the Otago Medical School Research Society, Wednesday 24 August 2011

Methuselah

109 Selected excerpts from Methuselah
This Issue in the Journal

Society’s expectation of the role of the doctor in New Zealand: results of a national survey
Andrew Old; Brandon Adams, Peter Foley; Harvey D White

In order to understand the perceptions of the New Zealand public as to the role of the doctor in 2010 a telephone survey of 502 individuals throughout New Zealand was undertaken.

Communication difficulties with limited English proficiency patients: clinician perceptions of clinical risk and patterns of use of interpreters
Ben Gray, James Stanley, Maria Stubbe, Jo Hilder

Medical staff in hospitals in the two Wellington area District Health Boards were surveyed about their use of interpreters when treating patients with limited English skills. A small number were also interviewed about an actual consultation with such a patient. A high percentage reported being aware of how to obtain an interpreter and what the DHB policy was and felt that language difficulties had significant effects on care. However, there was wide variation in their reported actual use of interpreters, and there was no use of professional interpreters in the actual consultations studied, despite staff acknowledging increased clinical risk. Awareness of the issues is clearly not enough to ensure high levels of interpreter use and more needs to be done to increase this to ensure an equitable level of care for patients with limited English language.

Improving clinician-patient communication of health risks when diagnostic test information is imprecise
John Fountain, Philip Gunby

Both clinicians and patients experience difficulty with the statistical reasoning required to make inferences about health states on the basis of information derived from diagnostic tests. This problem will grow in importance as we move into the era of personalised medicine where an increasing supply of imprecise diagnostic tests meets an increasing demand to use such tests on the part of intelligent but statistically innumerate clinicians and patients. We describe a user-friendly, interactive, graphical interface for calculating, visualising, and communicating accurate inferences about uncertain health states when diagnostic information (test sensitivity and specificity, and health state prevalence) is imprecise and ambiguous in its application to a specific patient. The software is free, open-source, and runs on all popular PC operating systems (Windows, Mac, Linux).
Compliance and quality in administration of a Surgical Safety Checklist in a tertiary New Zealand hospital
Nicole Vogts, Jacqueline A Hannam, Alan F Merry, Simon J Mitchell

A previous international study (in which Auckland City Hospital participated) showed that a safety checklist administered at 3 points during an operation reduced the collective rates of death and complications during surgery and in the post-operative period. A tailored version of this checklist has now been adopted by many NZ hospitals. We audited the administration of this checklist during 100 operations conducted at Auckland City Hospital. Many checklist items (and notably those relating to patient identity, the operation being performed and the site / side of the procedure) were administered in the vast majority of cases, but some checklist items were administered less consistently. Of most concern was the finding that the 3rd administration of the checklist (“sign out”), which should occur prior to the patient leaving the operating room, was not being done in the majority of cases. The effect of this omission on patient outcomes is not known. Engagement of operating room team members in the process of checklist administration was another area in which there is potential for improvement.

The financial impact of clinical task substitution between practice nurses and GPs in New Zealand primary care centres
Martin Hefford, Tom Love, Jacqueline Cumming, Mary Finlayson, Antony Raymont

The proportion of general primary care consultations undertaken by nurses varied from 4% to 46% of total recorded consultations. The actual financial impact for a practice owner of substituting more nursing time for GP time is highly dependent on the following variables: nurse cost per minute relative to GP cost minute; nurse consult duration relative to GP consult duration; nurse consult revenue relative to GP consult revenue; and the proportion of nurse consults also requiring GP time. Practice nurses can, and in some practices in NZ, do provide a broad set of primary care services, including undifferentiated general consultations. For some practices, increasing the proportion of nurse consults and reducing GP consults, would result in significantly improved profitability—for others, the opposite applies. Clinical task substitution (having nurses perform clinical tasks currently performed by doctors) is one option to address the forecast increase in demand associated with population ageing.
Magnetic Resonance Imaging (MRI): keeping abreast of current use


One of the most topical issues in Breast Surgery currently is the use of magnetic resonance imaging (MRI). Uncertainties exist amongst doctors regarding the use of MRI in clinical practice for breast cancer patients. There is a need for critical analysis of the current guidelines and close scrutiny of best available evidence to ensure appropriate use.

MRI basics

MRI technology was developed in the 1980s and uses radiofrequency pulses in a strong magnetic field to generate detailed cross-sectional imaging. The brightness of tissue in the images produced depends on the spin of hydrogen atoms and on the imaging sequence used (T1 or T2 weighted). Angiogenesis in tumours produces abnormal vessels and shunts. After injection of intravenous gadolinium, breast cancers exhibit rapid enhancement and often a washout effect, allowing its differentiation from adjacent benign tissue.

There are few contraindications to MRI and these are highlighted in most MRI request forms. Patients are required to lie prone during the scan and those suffering from anxiety or claustrophobia may require sedation or additional assistance. Anaphylactic reactions to gadolinium contrast are rare.

Increased breast parenchymal enhancement is normal during the secretory phase of the menstrual cycle and can give rise to false positive MRI scans. Breast MRI scans are thus recommended during the second week of the menstrual cycle (days 6–14).

Of all the imaging modalities for breast cancer, MRI is the most sensitive (92–98%) and reproducible across centres as long as contrast is used. Unlike mammography, the sensitivity of imaging is not affected by density, scar tissue, radiation therapy, implants (if MRI-compatible) or reconstruction.

Current guidelines for use

In 2008 the American College of Radiology (ACR) provided revised guidelines for MRI indications. These ACR guidelines form the basis of Health Insurance Companies coverage policies and relate to its use in screening, providing additional radiological evaluation to conventional imaging, and determining extent of disease.
Screening

The use of MRI in high-risk groups significantly improves detection of otherwise clinically and mammographically occult breast cancers. Such high risk groups include: genetic predispositions (e.g. BRCA 1 or 2, Li-Fraumeni syndrome, Cowden syndrome); women who have received radiation treatment to the chest between ages 10 and 30, such as for Hodgkin Lymphoma; any women with lifetime risk greater than 20% determined by standard risk assessment models (e.g. by the National Cancer Institute Risk Calculator). MRI is also indicated in screening patients with prior breast augmentation or reconstruction.\(^1\)

Cancer is detected in 5 to 7 of every 1000 women on the first screening mammogram and in 2 or 3 of every 1000 women who undergo regular screening mammography. In high-risk women, screening MRI significantly increases cancer detection—average 22 cancers per 1000 women screened. In women with inherited high risk for breast cancer, the accurate detection of number of malignant lesions was reported as 59% for mammography, 65% for ultrasonography, and 94% for MRI.\(^4\) The reported rate of multifocal and multicentric cancers in high-risk women is as high as 45–50%.

Extent of disease

Breast MRI is useful in determining the extent of neoplastic disease (both invasive and intra-ductal) and in evaluating residual disease in patients whose pathology specimens demonstrate close or positive margins for disease that is mammographically occult. MRI also detects occult malignancy in the contralateral breast (in 3 to 5%), and is useful in evaluating treatment response with neoadjuvant chemotherapy.

A recent meta-analysis of 22 studies showed 35% of new contralateral cancers seen on MRI were ductal carcinoma in-situ (DCIS) with a mean diameter of 7 mm, 65% were invasive with a mean diameter of 9.3 mm, and the majority of the latter were node negative.\(^5\)

In a recent systematic review of patients with invasive lobular cancer, additional ipsilateral lesions were detected with MRI in 32% of cases, contralateral lesions in 7%, while surgical management was changed in 28%.\(^6\)

Studies focusing on the accuracy of assessing the size of DCIS and extensive intra-ductal component (EIC) have shown that MRI (38–64% correct assessment) appears to be more accurate that mammography (27–43%), but neither method can be considered completely reliable.\(^7\) Intermediate, and especially low grade, DCIS may not be apparent on MRI.

Preoperative use of MRI—the evidence

Patients with the most potential benefit from a preoperative MRI include those with: mammographically dense breasts; a unilateral multifocal/multicentric cancer or synchronous bilateral cancers; lobular invasive cancer; cancers with >1 cm size discrepancy between mammographic and ultrasonographic imaging; or under consideration for partial breast irradiation.\(^8\)
More limited evidence exists in favour of MRI in evaluating candidates for total skin sparing mastectomy or for patients with Paget’s disease.

The potential outcome benefits include possible reduction in rates of the following events:

- Surgical intervention needed to achieve free margins,
- Ipsilateral recurrences,
- Secondary mastectomies, and
- Contra-lateral malignancy.

There is however a known increase in rate of the following events:

- Additional biopsies (up to 25% in some series, of which at least half will be found to be benign disease),
- Rate of mastectomy (a small but significant percentage of patients) and
- Delay to definitive surgery (median 17 days).

In a meta-analysis of 19 studies for the breast harbouring a proven index cancer, the impact of preoperative MRI on surgical planning was evaluated for 12 studies reporting surgical outcomes as follows:

- 8.1% conversion from wide local excision to mastectomy due to true positive findings;
- 1.1% conversion from wide local excision to mastectomy due to false positive findings;
- 3.0% conversion from wide local excision to wider/additional excision due to true positive findings;
- 4.4% conversion from wide local excision to wider/additional excision due to false positive findings.

The results of two Randomised Controlled Trials—the COMICE and the MONET studies—are awaited, although very early data from COMICE have not indicated survival benefit from preoperative MRI or reduced re-operation rates in women scheduled for wide local excision.

**Current use**

We have performed a retrospective review of prospectively collected data to evaluate the use of MRI in our own surgical setting for preoperative surgical planning in patients with breast cancer. Over a 12-month period from March 2009 a total of 33 MRI scans were performed.

Preoperative pathological diagnoses were: invasive lobular cancer 56%, DCIS 22%, invasive ductal cancer 19% and other 4%. Cases were discussed in a multidisciplinary forum. The imaging allowed 30% of patients with invasive lobular cancer to confidently undergo breast conserving surgery. There were no non-definitive resections or unnecessary mastectomies in patients who had undergone preoperative MRI. There were no additional biopsies following MRI in our series.
In 50% of cases, the reported size of in situ lesions on MRI was more than 5 mm greater than the measured pathological tumour size. This over-estimate did not result in compromised definitive surgery. We found the use of MRI complimented conventional triple assessment and improved surgical decision making in appropriately selected cases.

**Future use**

There is a learning curve for the use of MRI within the radiological-surgical team. Issues regarding clinical efficacy/effectiveness and cost-benefit are still under investigation. Technological improvements, such as diffusion weighted imaging and proton spectroscopy, are expected to enter clinical practice soon.

Breast Surgery units will need to develop practices that ensure MRI is used according to evidence-based guidelines and also taking into account local experience.

**Competing interests:** None.

**Author information:** Paul Samson, Breast & Endocrine Fellow; Richard Harman, Breast & Endocrine & Melanoma Surgeon, Department of General Surgery, North Shore Hospital, Takapuna, Auckland; Richard Beedie, Diagnostic & Interventional Radiologist, Department of Radiology, North Shore Hospital, Takapuna, Auckland; Michael J Baker, Diagnostic & Interventional Radiologist, Auckland Breast Centre and The Radiology Group, Milford, Auckland

**Correspondence:** Paul Samson, Department of General Surgery, Southland Hospital, PO BOX 828, Invercargill, New Zealand. Email: teamsamson@hotmail.com

**References:**


Society’s expectation of the role of the doctor in New Zealand: results of a national survey

Andrew Old, Brandon Adams, Peter Foley, Harvey D White

Abstract

**Aims** To describe the perceptions of the New Zealand public as to the role of the doctor in 2010.

**Methods** Telephone survey of 502 individuals throughout New Zealand during May 2010. The questions were based on a United Kingdom survey with added questions in respect of culture, equity and resource allocation. The data were weighted by gender and age according to the 2006 population census.

**Results** Most respondents (82%) wanted to see a doctor first if they had a new concern about their health; 7% a nurse and 5% a pharmacist. Most respondents agreed (88%) that when visiting a doctor, getting an accurate diagnosis was their top priority. In respect of a doctor’s personal qualities, integrity was expected (94%), as was compassion (89%). Most respondents (78%) agreed that they expected a doctor to be the leader of the healthcare team. Most agreed (70%) that there is limited money available and doctors must consider how best to use it for all patients and that doctors (82%) need to be involved in decisions about health spending.

**Conclusion** This comprehensive New Zealand survey provides important information about public perceptions of the role of the doctor and is a basis for workforce planning and future comparisons.

The role of the doctor continues to evolve as society changes. From being an authoritarian figure practising in an autocratic and often isolated way, the doctor’s role has changed to one where partnership with patients is the cornerstone of the relationship. Advances in science and technology, including increased use of the internet, and the increasingly multidisciplinary approach to healthcare have also contributed to the changing relationship.

Several countries have attempted to define the role of doctors and articulate what differentiates them from other health practitioners, including some which have developed consensus statements.1,2

Led by the New Zealand Medical Association (NZMA), the profession in New Zealand has also developed a consensus statement following a 2-day meeting in Wellington attended by over 70 leaders of various medical organisations along with colleagues from government departments, nursing, health management and other experts.

In addition, perspectives from patients as to the evolving role of the doctor and their expectations and requirements are very important. These perspectives are likely to vary in relation to a wide range of sociodemographic factors including age, gender, educational status and ethnicity. Further, an increasing number of patients are
computer-literate and have access to and are familiar with the internet. Their requirements from healthcare providers continue to change.

We therefore commissioned a survey to obtain contemporary information about patient perspectives of the role of the doctor in New Zealand in 2010.

Methods

Computer assisted telephone interviewing (random digit dialling) was undertaken by Research New Zealand Ltd between 18 and 25 May 2010. Responses were received from a nationally representative sample of 502 adult New Zealanders over 15 years of age. The response rate was 21.2%.

Eighteen questions were chosen based on questions used in a United Kingdom survey commissioned to aid their role of the doctor consensus statement development, with minor changes made to aid understanding in a New Zealand context. Four additional questions (Figures 3c, 3d and 5c, 5d) tailored to the New Zealand situation were included focusing on ethnicity, equity, culture and resource allocation.

The data were weighted by gender and age to ensure that the results are truly representative of the New Zealand population. The weighting parameters were sourced from Statistics New Zealand and based on the 2006 Census of Population and Dwellings. Responders were grouped into three age groups; 15–34, 35–54 and ≥55 years.

Results based on the weighted total sample are subject to a maximum margin of error of +/- 4.8% at the 95% Confidence level (CI). This means, for example, that if 50% of respondents would prefer to see a doctor first if they had a new concern about their health, we could be 95% sure of getting the same result, plus or minus 4.8%, had everyone in the population been interviewed. Higher margins of error apply in the case of sub-sampling. Comparisons are made with similar questions to the United Kingdom sample. No statistical meaning is assigned to these comparisons.

Results

The demographic profile of the 502 survey respondents is shown in Table 1. Most were New Zealand European (78%), 10% were Māori, 5% Asian, 3% Pacific and 8% from other groups. There was a broad range of age groups and a slight bias toward female respondents (52%).

The questions were grouped according to who the respondents wanted to see first, general expectations of doctors, expectations with respect to personal qualities, expectations with respect to knowledge and experience, expectations with respect to doctors’ role in the healthcare system, and involvement in decision making related to spending. The results are shown in Figures 1–5.

Expectation of who should be seen first

Most respondents (82%) wanted to see a doctor first if they had a new concern about health (Figure 1a); 7% a nurse and 5% a pharmacist. Interestingly, the rate of those wanting to see a nurse first was lower in respondents ≥55 years of age compared with respondents aged 15–34 years (3% vs 12%), but similar (4% vs 3%) for those wanting to see a pharmacist.

A majority (75%) thought it was not necessary to see a medical specialist first when they had a new concern about their health (Figure 1b) and this rate was higher (83%) in respondents aged >55 years. Conversely the percentage of respondents who would prefer to see a specialist first increased from 8% in older respondents to 19% in younger respondents.
Table 1. Demography of survey respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>N=502</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male, %</td>
<td>48</td>
</tr>
<tr>
<td>Female, %</td>
<td>52</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>15 to 24, %</td>
<td>18</td>
</tr>
<tr>
<td>25 to 34, %</td>
<td>17</td>
</tr>
<tr>
<td>35 to 44, %</td>
<td>17</td>
</tr>
<tr>
<td>45 to 54, %</td>
<td>19</td>
</tr>
<tr>
<td>55 to 64, %</td>
<td>10</td>
</tr>
<tr>
<td>65+, %</td>
<td>19</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>NZ European, %</td>
<td>78</td>
</tr>
<tr>
<td>Māori , %</td>
<td>10</td>
</tr>
<tr>
<td>Pacific Islander, %</td>
<td>3</td>
</tr>
<tr>
<td>Asian, %</td>
<td>5</td>
</tr>
<tr>
<td>Middle East/Latin, %</td>
<td>1</td>
</tr>
<tr>
<td>Other, %</td>
<td>7</td>
</tr>
<tr>
<td>Income</td>
<td></td>
</tr>
<tr>
<td>Under $40,000, %</td>
<td>38</td>
</tr>
<tr>
<td>$40,000–$69,999, %</td>
<td>22</td>
</tr>
<tr>
<td>$70,000 plus, %</td>
<td>27</td>
</tr>
<tr>
<td>Don’t know/refused, %</td>
<td>13</td>
</tr>
<tr>
<td>Region*</td>
<td></td>
</tr>
<tr>
<td>Waikato, %</td>
<td>7</td>
</tr>
<tr>
<td>Auckland, %</td>
<td>29</td>
</tr>
<tr>
<td>Bay of Plenty, %</td>
<td>7</td>
</tr>
<tr>
<td>Wellington-Wairarapa, %</td>
<td>10</td>
</tr>
<tr>
<td>Canterbury, %</td>
<td>27</td>
</tr>
</tbody>
</table>

*7% or more.

General expectations

Most respondents strongly agreed (70%), with 88% agreeing overall, that getting an accurate diagnosis was their top priority (Figure 2a) with very few strongly disagreeing or disagreeing. Most respondents (73%) also strongly agreed that knowing when to seek help or advice from others was expected with few disagreements (3%) (Figure 2b).
Figures 1a–1b. Expectations with respect to seeing a doctor first with a new health concern

Figure 1a. When you have a new concern about your health, is the first person you want to see...

```
<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t know</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
</tr>
<tr>
<td>Some other health practitioner</td>
<td>2%</td>
</tr>
<tr>
<td>A pharmacist</td>
<td>5%</td>
</tr>
<tr>
<td>A nurse</td>
<td>7%</td>
</tr>
<tr>
<td>A doctor</td>
<td>82%</td>
</tr>
</tbody>
</table>
```

Figure 1b. When seeing a doctor, would you prefer to be seen by a specialist first, rather than a doctor who has more general expertise?

```
<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t know</td>
<td>1%</td>
</tr>
<tr>
<td>Depends</td>
<td>9%</td>
</tr>
<tr>
<td>No, not necessary</td>
<td>75%</td>
</tr>
<tr>
<td>Yes, a specialist first</td>
<td>14%</td>
</tr>
</tbody>
</table>
```
Figures 2a–2d. General expectations of doctors

Figure 2a. If I went to see a doctor, my top priority would be that the doctor accurately diagnoses what is wrong with me

![Bar chart showing responses to Figure 2a.]

Don't know 1%
Strongly agree 90%
Agree 8%
Neutral 2%
Disagree 1%
Strongly disagree 1%

Figure 2b. I expect a doctor to know when to ask for help or advice from others

![Bar chart showing responses to Figure 2b.]

Don't know 1%
Strongly agree 73%
Agree 20%
Neutral 4%
Disagree 2%
Strongly disagree 1%
Figure 2c. I expect any doctor I go and see to be a helpful source of health education and advice

Expectations of knowledge and experience

Doctors as a source of education and advice were rated highly (overall agreement 91%) (Figure 2c) and few disagreed. Most (89%) expected doctors to know health issues well and to coordinate care over time.

Figure 2d. I expect my doctor to know my health issues well and coordinate my care over time

Expectations of personal qualities

Integrity was expected (agree 94%), as was compassion (89%) (Figure 3a and 3b) with females valuing compassion more highly than males (females 95%, males 84%). Respondents thought it was important that doctors cared about them and not just their health with 71% agreeing with this statement and 21% being neutral. Sixty-four percent of respondents expected doctors to understand and respond to their cultural needs with 11% disagreeing (Figure 3d), and there was a high neutral response of 23%.
Figures 3a–3d. Expectations with respect to doctors’ personal qualities

Figure 3a. It is essential that a doctor is a person of integrity

Figure 3b. I expect any doctor I see to treat me with compassion

Figure 3c. It is important that any doctor I see cares about me and not just my health
There was agreement that doctors should have an understanding of science (80%) with 4% disagreeing and 14% having a neutral view (Figure 4a). There was overwhelming support (97%) for doctors to keep up with developments in medicine (Figure 4b). Experience and wisdom (both 92%) were also highly valued (Figure 4c and 4d).

Figures 4a—4d. Expectations with respect to doctors’ knowledge & experience

Figure 4a. It is important that doctors have an understanding of science
Figure 4b. It is essential that doctors keep up to date with developments in medicine

Figure 4c. Doctors need sufficient experience to recognise how even common conditions can show up differently in different people

Figure 4d. A doctor's wisdom and accumulated experience is important to me
Expectations of the role of doctors in the health system

Coordination of health care—Most respondents (89%) expected the doctor to coordinate their health care with only 5% disagreeing. Most respondents (78%) also agreed that they expected a doctor to be the leader of the health care team responsible for their healthcare (44% strongly, 34% agree) (Figure 5a). A small number strongly disagreed (2%) and 15% were neutral. This compares with United Kingdom figures for agreement of 70% (strongly 31%, agree 39%) with 1% strongly disagreeing and neutral 22%.

In respect of whether they would be happy that the healthcare team was led by a nurse rather than a doctor 28% agreed (strongly 7%), and 17% strongly disagreed with 26% neutral. The United Kingdom respondents had a higher rate of agreement (37%) and a lower rate of strongly disagreeing (8%). The number of neutral respondents (26%) was the same in both surveys.

Figures 5a–5d. Expectations with respect to doctors’ role in the healthcare system and involvement in decision-making relating to spending

Figure 5a. I would expect a doctor to be the leader of the team that is responsible for my healthcare

![Chart showing responses to perceived role of doctors in coordinating health care.]

Strongly agree: 44%, Agree: 34%, Neutral: 15%, Disagree: 3%, Strongly disagree: 2%

Figure 5b. I would be happy that the team responsible for my health care is led by a nurse rather than a doctor

![Chart showing responses to preference for nurse-led care.]

Strongly agree: 7%, Agree: 23%, Neutral: 26%, Disagree: 27%, Strongly disagree: 17%
Figure 5c. There is a limit to how much money there is available for health, so doctors must consider how best to use it for all their patients and not just the person in front of them

![Bar graph showing responses to the statement](image)

Figure 5d. Doctors need to be involved in decisions about healthcare spending

![Bar graph showing responses to the statement](image)

### Involvement in decision making relating to healthcare spending

Most agreed (70%) that there is a limit on the amount of money available for health and doctors must consider how best to use it for all patients. This view was less strongly held in the United Kingdom (51%) where 23% disagreed compared with 15% disagreement in New Zealand. Similar support was found for the statement that doctors need to be involved in decisions about health spending in New Zealand, 82% (No United Kingdom comparison).

### Discussion

This is the first national New Zealand survey of the general publics’ perception of the role of New Zealand doctors. The scientific basis of the survey is rigorous based on 502 respondents who answered the questions fully. The respondents were representative of the New Zealand population in respect of age, gender, ethnicity and income as well as having wide regional representation. Thus the results can be
interpreted as being representative of contemporary perceptions of New Zealanders within the margin of error of ±4.8%.

The findings show that the expectations of scientific knowledge and personal attributes of integrity, experience and compassion are highly valued. Most respondents supported a generalist doctor rather than a specialist as their first contact although higher numbers of younger respondents (19% vs 8%) preferred to see a specialist. Interestingly, younger respondents were more likely to report wanting to see a nurse first with new concerns about their health (12% in those aged 15–34 years versus 3% in those aged over 55). Taken together, these age-related differences raise interesting questions about the future of the general practitioner as the first point of contact.

There was strong support for medical leadership in healthcare teams. There was also strong support for doctors to be involved in discussions about health spending.

We found minimal differences in public perception between the United Kingdom respondents to the 2008 survey and New Zealand respondents in respect of the similar questions that were asked.

There are several potential limitations of our survey including the selection of respondents and in particular whether they are representative of patients. An alternative approach may have been to set up a website and to ask for comments from the general public. This would have had the major limitation of not knowing what drove respondents to respond; were they the ones who were angry, or satisfied, or did they come from an interest group. Such a survey would also be limited to those who were internet savvy but could provide a useful contribution in addition to this work in the future.

Conclusion

This survey provides contemporary information as to the perception of doctors by the New Zealand public. The findings should be taken into account when defining the Role of the Doctor in New Zealand for the purposes of workforce planning, and further understanding the evolution of the doctor patient relationship. It is hoped that as the role of the doctor in New Zealand changes, further surveys will be undertaken that can use this survey as a comparison.

Competing interests: None.

Author information: Andrew Old, Public Health Physician, Auckland City Hospital, Auckland and previous NZMA Board Member; Brandon Adams, Plastic Surgical Registrar, Wellington Hospital, Wellington and previous NZMA Board Member; Peter Foley, General Practitioner, Napier, Hawke's Bay and previous Chairman of NZMA, Harvey White, Cardiologist, Auckland City Hospital, Auckland and NZMA Board Member and Chairman of NZMA Specialist Council.

Acknowledgements: We would like to thank the Board of the NZMA as well as Charlene Nell (Team Support Administrator, Green Lane Cardiovascular Research Unit) for her excellent secretarial assistance.
Correspondence: Professor Harvey White, Green Lane Cardiovascular Service, Auckland City Hospital, Private Bag 92024, Victoria St West, Auckland 1142, New Zealand. Fax: +64 (0)9 6309915; email: HarveyW@adhb.govt.nz

References:

   http://www.medschools.ac.uk/AboutUs/Projects/Documents/Role%20of%20Doctor%20Consensus%20Statement.pdf


   http://www.yougov.co.uk/extranets/ygarchives/content/pdf/RESULTS%20for%20Bright%20Young%20Things.pdf
Communication difficulties with limited English proficiency patients: clinician perceptions of clinical risk and patterns of use of interpreters

Ben Gray, James Stanley, Maria Stubbe, Jo Hilder

Abstract

Aims To explore clinicians’ perceptions of the communication difficulties experienced with Limited English Proficiency (LEP) patients and the clinical risks these difficulties pose in hospitals, as well as patterns of interpreter use among these clinicians.

Methods Senior health professionals in the two District Health Boards (DHBs) in the Wellington Area (about 900) of New Zealand were sent an electronic survey. Twenty clinicians were interviewed about their experience in 22 consultations with LEP patients, and an equal number with English proficient patients. Descriptive statistics were calculated, and 95% confidence intervals and formal statistical tests.

Results 141 responses were received to the survey. There was a high level of awareness of how to access interpreters (84%) and lesser awareness of DHB interpreter policy (65%). Most respondents felt that communication difficulties with LEP patients have a significant effect on care at least sometimes, but there is a wide variation in reported actual use of interpreters, with only 14% always using an interpreter. In the actual consultations studied, no professional interpreters were used despite clinician acknowledgement of increased clinical risk.

Conclusion Even when clinicians are aware of policy, of how to obtain interpreters, and of the increased clinical risk in the situation, this does not necessarily lead to high levels of interpreter use with LEP patients.

New Zealand (NZ) has an increasingly diverse population, and health services now deal with significant numbers of Limited English Proficiency (LEP) patients. The international literature shows that identifiable misunderstandings occur far more frequently in consultations with LEP patients, and that failure to use a professional interpreter leads to increased risk of adverse outcome.

Language barriers have been found to increase risks to patient safety and affect clinicians’ ability to understand symptoms and treat disease. Despite these risks, interpreters are often not used for complex reasons that go beyond time constraints and lack of interpreter availability, with doctors often preferring to ‘get by’ without an interpreter even when interpreters are readily available. In many cases, family members are relied upon for interpreting.

The small amount of NZ research in this field has shown that bilingual medical students are on occasion asked to interpret for patients in hospitals, sometimes resulting in unsafe practice, and that there are difficulties in communication with LEP patients for general practitioners in Auckland.

NZMJ 9 September 2011, Vol 124 No 1342; ISSN 1175 8716
©NZMA
There is no evidence available on how frequently communication is a problem for LEP patients in NZ hospitals.

District Health Boards (DHBs) in areas with large immigrant populations now have policies that interpreters be used for LEP patients. For example, Capital & Coast DHB’s policy states that an interpreter is required when “health professionals assess that an interpreter is necessary to ensure safe and adequate assessment, planning, and intervention of care and treatment, e.g. to obtain informed consent”, outlines the risks of using untrained interpreters, gives guidance on how to assess the need for an interpreter and how to use one, and states who should bear the cost.

Interpreting services are still not fully developed in NZ, and there is no NZ accreditation system for interpreters. Telephone interpreters are now readily available, since the establishment in 2003 of “Language Line” which provides affordable, accessible telephone interpreting services.

In most circumstances they are able to provide an interpreter at the time of the request in many languages, often utilising interpreters in Australia. However, uptake is only slowly increasing, and the service is only available from 9am to 6pm Monday to Friday and 9am to 2pm on Saturdays.

While the literature on use of interpreters in medical care has frequently explored patient and/or clinician satisfaction, effects on quality of care, and patterns of use, we have found none that specifically explores clinicians’ perceptions of the increased clinical risk when interpreters are not used. The aim of this study is to explore clinicians’ perceptions of the communication difficulties experienced with LEP patients and the clinical risks these difficulties pose in hospitals in the Wellington area. It also explores patterns of interpreter use among these clinicians.

**Methods**

The study was conducted in two phases, the first a survey of senior health professionals in the two District Health Boards in the Wellington Area, and the second a questionnaire targeted to a small number of clinicians as they actually encountered LEP patients. Approval to conduct this study was granted by the Central Regional Ethics Committee.

**Phase 1**—In Phase 1 of the study, an e-mail asking respondents to complete a survey online was sent to all clinicians who consulted independently in Wellington, Kenepuru and Hutt Hospitals—this included senior doctors, registrars, dentists, physiotherapists, occupational therapists, social workers and nurses in Capital & Coast District Health Board (CCDHB) and Hutt Valley District Health Board (HVDHB). We excluded house surgeons and ward nurses but included district nurses and specialist nurses (diabetes, respiratory etc). In addition, paper copies of the survey were also distributed in the Emergency Department of Wellington Hospital, and the survey link may have been forwarded by some respondents to colleagues. In total the survey was distributed to around 900 health professionals.

A list of survey questions is provided in Appendix 1. In addition to demographic questions, the survey asked clinicians questions about:

- What languages they speak,
- How often they see LEP patients,
- How often they use interpreters (professional or otherwise) with LEP patients,
- Their awareness of DHB policy on interpreters and knowledge of how to access them, and
- Whether they felt that communication difficulties significantly affected their care of LEP patients.
Within the survey, an LEP patient was defined as “a person for whom English is not their first language AND whose level of English limits the extent of communication in the consultation. This group includes 1) Speakers with very little English, such that consultation is not possible without an interpreter OR 2) Speakers with some English but insufficient English to conduct a comprehensive consultation.”

Data were exported from the online survey to Microsoft Excel/Access software for data cleaning (e.g. removing duplicate responses) and further organisation (e.g. calculating number of languages spoken by each respondent.) Descriptive statistics were calculated using Microsoft Excel software; 95% confidence intervals and formal statistical tests were calculated using R (R 2.9.1, R Foundation, Austria).

Phase 2—Phase 2 of the study investigated the actual communication between a small number of LEP patients and clinicians in patient consultations, and an equal number of English proficient patient consultations. This phase was conducted predominantly in the Emergency Department (ED) of Wellington Hospital where there was clinician support for the research. Some interviews were also conducted at the ED Short Stay Unit, a medical ward where patients were transferred from ED, the Medical Assessment and Prioritisation Unit, the Outpatient Department, the Pacific Congestive Heart Failure Unit, and the Neonatal Unit.

When a patient presented who was registered as born outside NZ, a research nurse spoke with the clinician to determine if there had been any language difficulty. When language difficulty was identified, the nurse interviewed the clinician at a convenient time and noted their answers to a questionnaire (see Appendix 2). To provide a comparison group, the clinician was interviewed regarding consultation with the next English proficient patient after this LEP patient.

Questions covered whether this was a first consultation with the patient, the complexity of the consultation, any communication difficulties, whether there was extra clinical risk as a result of these, as well as the clinician’s assessment of the patient’s English-speaking ability and details of any interpreter usage. The research nurse also noted any additional comments that the clinician made about communication with LEP patients in general. The same list of questions was used for the LEP patients and the comparison group patients.

Data analysis—Descriptive statistics were mostly used to summarise clinicians’ responses. For categorical data regarding knowledge and use of interpreters, 95% confidence intervals are reported in the text. Ordinal data on frequency of interpreter use and frequency of communication problems were analysed using non-parametric tests, as noted in the results section – non-parametric equivalents of the t-test/ANOVA for comparing answers between groups (Wilcoxon Signed Ranks Test, Mann-Whitney test, Kruskal-Wallis test), and non-parametric versions of correlations (Spearman’s rank correlation coefficient) when asking whether scores on one ordinal variable were associated with higher scores on another ordinal variable. McNemar’s Chi-squared statistic was used to ask whether knowledge of DHB policy was independent of practical knowledge on how to access interpreters.

Results

Phase 1

A total of 141 responses were received, which was a 15.6% return rate. Not all survey responses contained answers to all questions.

Demographic characteristics—Most of the respondents (85%) were of European (64% NZ European) ethnicity (calculated using prioritised ethnicity⁰), with the remainder split between Asian (5.7%), Māori (3.5%), Pacific (2.8%) and Other (2.1%). They were predominantly female (64%).

In terms of positions held, the largest group of respondents were Senior Medical Officers (38%), with significant numbers of registrars (24%) and nurses (21%). Senior House Officers made up 5% and Others (12%) included 6 occupational therapists, 5 social workers, 4 senior dentists, a hand therapist and a midwife. The
level of experience of the respondents ranged from 1 year to 42 years, with a median of 15.5 years.

**Language background of respondents**—Most respondents (72%) were monolingual English speakers, but more than a quarter (28%) were bi- or multilingual. NZ Europeans had a lower level of bi- or multi-linguality compared to other ethnicities, as shown in Table 1.

### Table 1. Number of languages spoken by respondents, by ethnicity (Phase 1)

<table>
<thead>
<tr>
<th>Prioritised ethnicity</th>
<th>Number of languages spoken</th>
<th>Percentage who speak more than 1 language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2 or more</td>
</tr>
<tr>
<td>NZ European</td>
<td>79</td>
<td>10</td>
</tr>
<tr>
<td>European</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Māori</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Pacific</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

The most commonly spoken additional languages were European languages, as shown in Table 2.

### Table 2. Languages spoken by respondents (Phase 1)

<table>
<thead>
<tr>
<th>Languages spoken in addition to English</th>
<th>Number of respondents</th>
<th>% of total respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>European languages</td>
<td>34</td>
<td>23.9%</td>
</tr>
<tr>
<td>Eastern Asia languages</td>
<td>9</td>
<td>6.3%</td>
</tr>
<tr>
<td>African languages</td>
<td>7</td>
<td>4.9%</td>
</tr>
<tr>
<td>Central Asian languages</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td>Pacific languages (including Māori)</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td>Middle Eastern languages</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td>NZ Sign Language</td>
<td>1</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

**Respondents’ interaction with LEP patients and interpreters**—About a third of respondents (32.17%) reported seeing no LEP patients on a regular basis, and almost another third saw one to two patients per week, as shown in Figure 1. About 35% saw three to seven LEP patients per week.

The survey asked two questions about interpreter use: “When you see a patient with Limited English Proficiency (LEP) do you use an interpreter?” and “Do you use a professional interpreter (paid by the DHB)?”, with responses on a five point scale ranging from ‘never’ to ‘always’. Results are shown in Table 3 (note that the column headings reflect the fact that only 3 of the 5 points on the scale were labelled in the questionnaire).
Figure 1. Number of Limited English Proficiency (LEP) patients seen per week

![Bar chart showing the number of LEP patients seen per week](chart.png)

Table 3. Frequency of interpreter use (Phase 1)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Never</th>
<th>About half</th>
<th>Always</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpreter use</td>
<td>7 (5%)</td>
<td>29 (21%)</td>
<td>40 (29%)</td>
<td>41 (30%)</td>
</tr>
<tr>
<td>Professional Interpreter use</td>
<td>17 (13%)</td>
<td>37 (27%)</td>
<td>34 (25%)</td>
<td>27 (20%)</td>
</tr>
</tbody>
</table>

Although few respondents reported never using any form of interpreter, there is wide variation in the frequency of interpreter use among those who do. A slightly higher proportion reported never using professional interpreters with again a wide variation of frequency of use.

More respondents reported knowing how to access an interpreter if they needed one (84%; CI=77-89%) than reported awareness of their DHB’s policy on interpreters (65%; CI=56-72%). Twenty-five percent lacked awareness of both the policy and of how to access professional interpreters (CI=18-33%), while 60% knew both the policy and how to access professional interpreters (CI=50-67%).

Answers to these two questions appeared to group together (85% of all respondents answered yes to both or no to both) and there was no tendency for respondents to either know the DHB policy but not how to access interpreters, or vice versa (McNemar Chi-squared=0.273, p=0.602).

Most respondents felt that communication difficulties with LEP patients have a significant effect on care at least some of the time, with 49% feeling that difficulties occurred more than half the time (see Table 4).
Table 4: Perceived frequency of significant effect of communication difficulties on care of LEP patients (Phase 1)

<table>
<thead>
<tr>
<th>Frequency (percentage)</th>
<th>Never</th>
<th>About half</th>
<th>Always</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>28</td>
<td>27</td>
<td>8</td>
</tr>
</tbody>
</table>

Correlations between variables—Table 5 shows the results of various statistical tests to explore the relationships between reported frequency of interpreter use and other variables.

Table 5. Statistical test results for relationships with frequency of interpreter use

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interpreters in general</th>
<th>Professional interpreters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono-lingual or multi-lingual</td>
<td>Mann-Whitney U=1688, p=0.310</td>
<td>Mann-Whitney U=1430.5, p=0.038 (new target alpha=0.025 for two comparisons)</td>
</tr>
<tr>
<td>Position held</td>
<td>Kruskal-Wallis Chi-squared statistic (3 d.f.)=1.89, p=0.595</td>
<td>Kruskal-Wallis Chi-squared statistic (3 d.f.)=0.64, p=0.888</td>
</tr>
<tr>
<td>Years of experience</td>
<td>Spearman’s rho=0.217, p=0.011</td>
<td>Spearman’s rho=0.217, p=0.034 (new target alpha=0.025)</td>
</tr>
<tr>
<td>Awareness of DHB policy</td>
<td>Mann-Whitney U=1794, p=0.161</td>
<td>Mann-Whitney U=1494, p=0.005</td>
</tr>
<tr>
<td>Knowledge of how to access professional interpreters</td>
<td>Mann-Whitney U= 916.5, p=0.044</td>
<td>Mann-Whitney U= 691.5, p&lt;0.001</td>
</tr>
<tr>
<td>Number of LEP patients seen each week</td>
<td>Spearman’s correlation -0.166, p=0.053</td>
<td>Spearman’s correlation coefficient=-0.257, p=0.003</td>
</tr>
</tbody>
</table>

There were no significant differences in reported frequency of interpreter use in general according to whether respondents were mono-lingual or multi-lingual respondents, what position they held, or how aware of DHB policy they were, although professional interpreter use was higher among those with awareness of policy.

Years of experience was associated with more frequent interpreter use in general. There was weak evidence of an association with more frequent use of professional interpreters (although this relationship was not significant after adjusting for multiple tests).

Knowledge of how to access professional interpreters was associated with more frequent use of both interpreters in general and professional interpreters.

Respondents who see more LEP patients per week (considered as an ordinal variable) tend to use interpreters less frequently as a proportion of all LEP patients. This relationship was strongest for professional interpreters. For interpreters in general, the findings were inconclusive (falling outside the required level when alpha was adjusted for multiple comparisons).
There was weak evidence that multi-lingual respondents used professional interpreters less frequently than mono-lingual respondents but this result was not significant after adjusting for multiple comparisons.

Table 6 shows Mann-Whitney results that indicate that there were no differences in clinicians’ perceptions of communication difficulties with LEP patients relating to awareness of DHB policy or how to access professional interpreters.

Table 6. Statistical test results for relationships with perception of communication difficulties with LEP patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of DHB policy</td>
<td>Mann-Whitney U=2039, p=0.818</td>
</tr>
<tr>
<td>Knowledge of how to access professional interpreters</td>
<td>Mann-Whitney U= 1055, p=0.248</td>
</tr>
</tbody>
</table>

Phase 2

Questionnaires were administered to 20 clinicians (6 doctors, 13 registered nurses and one radiographer) regarding 22 LEP consultations (13 in ED) and 21 English proficient consultations. In two cases, the same patient was seen by two clinicians and data was gathered on each consultation separately.

Most of the LEP patients (87%) spoke very little or only intermediate English, as judged by the clinicians (Table 7).

Table 7. Clinician perception of English-speaking ability of LEP patients seen in Phase 2

<table>
<thead>
<tr>
<th>English-speaking ability</th>
<th>Number of LEP patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native English speaker or equivalent</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Fluent (fluent English speaker with some limitations)</td>
<td>3 (13%)</td>
</tr>
<tr>
<td>Intermediate (some English but insufficient to conduct a comprehensive consultation)</td>
<td>7 (32%)</td>
</tr>
<tr>
<td>Very little (so little that a basic consultation is not possible without an interpreter)</td>
<td>12 (55%)</td>
</tr>
</tbody>
</table>

Differences between the LEP consultations and the control group that might affect the quality of the communication were tested. The complexity of the consultation was rated higher for the LEP patients than for the controls (Related-Samples Wilcoxon Signed Ranks Test=0.38), although whether clinician perception was skewed by the confounding communication difficulties, or whether LEP patients may present with more complex issues (possibly due to a reluctance to face the communication difficulties for less complex issues) is not able to be determined.

The perceived communication difficulties in the LEP consultations were judged to increase clinical risk, as shown in Table 8.
Table 8. Clinician perception of clinical risk in LEP consultations in Phase 2

<table>
<thead>
<tr>
<th>Type of risk</th>
<th>Uncertainty as to whether medical terms were understood</th>
<th>Uncertainty that treatment regime was understood</th>
<th>Uncertainty that informed consent was adequately obtained</th>
<th>Part of the history was avoided due to communication difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1st Quartile</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3rd Quartile</td>
<td>4.75</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Degree of risk: 1=minimal; 3=moderate; 5=considerable.

**Interpreter use**—An interpreter was used in 17 of the 21 LEP consultations, none of whom were professional interpreters. No telephone interpreters were used, although in one consultation an attempt was made to obtain one. Family members were used in 11 consultations, a nurse was used in four consultations, and other ad hoc interpreters (social worker or member of a refugee group) were used in two consultations.

The communication difficulties that clinicians experienced were mostly problems with patients’ responses (no response, yes/no responses only, or variable responses), apparent lack of comprehension by the patient (including difficulty with following instructions) and clinician difficulty in understanding the patient. In three consultations, the patient’s condition (dementia or Parkinson’s) also contributed to communication difficulties.

**Discussion**

This study shows that hospital clinicians do perceive there to be clinical risk associated with the communication difficulties that they face with LEP patients, but despite this, rarely use trained interpreters. There is a clear mismatch between actual practice and the relatively high levels of awareness of policy, methods of accessing interpreters and the significance of communication difficulties for quality of care. Although 20% of respondents in Phase 1 felt that communication difficulties with LEP patients significantly affect their care, and 84% claim to know how to access professional interpreters, only 14% report always using an interpreter.

In the study of actual practice (Phase 2), most of the 22 consultations with LEP patients used an interpreter but none used trained interpreters, and in only one case was an attempt made to engage one, again despite the clinicians’ acknowledgement of extra clinical risk in most cases.

The finding that family members were the most commonly used form of interpreter accords with the literature. One consultation was (in the clinician’s view) successfully interpreted by a family member such that there was minimal clinical risk, which suggests that there are situations where such interpreters may be appropriate, but in most other consultations, the clinicians perceived risk in this practice.

These results contrast with the relatively higher use of professional interpreters found in a general practice in Newtown, Wellington, but where family members were also commonly used, often satisfactorily. The very different contexts probably account for these differences.
In the Phase 1 survey, no significant differences in the frequency of use of trained interpreters were found between clinicians of different demographics (e.g. more experience, being multilingual themselves etc). A higher level of bi- or multi-linguality was found in the surveyed population than in the general population (17.5%), although less than in a study of doctors in Auckland in which more than half spoke more than one language.

The relatively high level of bi- or multi-linguality may reflect the foreign-born status of many doctors and/or be a selection effect in that speakers of more than one language are more interested in or aware of language issues and thus more likely to respond to the survey. However, the hypothesis that such clinicians would be more sensitive to the issues and more likely to use interpreters was not borne out.

Awareness of DHB policy did seem to be associated with greater use of trained interpreters, and more experienced clinicians did report higher interpreter use in general, including untrained interpreters. These two points indicate that training to make clinicians more aware of policy and to share the knowledge and awareness that their more experienced colleagues attain over time would increase the frequency of use of interpreters.

This study has limitations in that only clinician perspectives were examined, and the response rate to the Phase 1 survey was low. It is possible that the opinions of those people who responded to the survey are different from the opinions of non-responders, leading to potential bias in the results. Given that further information was not available on the non-responders, it is not possible to speculate on the potential direction of this bias.

It is not clear whether all respondents interpreted the question asking them how often they used interpreters (as opposed to “professional interpreters”) in the same way, as some may not have counted use of family members in this role when answering this question. The number of actual consultations studied in Phase 2 was also small and mostly limited to those in ED due to logistical difficulties. Patient perspectives and actual clinical outcomes would be useful measures to study in future research.

Trained interpreters were found to be seldom used in hospitals. The question remains as to why this is the case. It is clearly not because clinicians feel that current practice is satisfactory. Future research will be needed to explore the possible explanations for this, which might include a problem with current policy (which may be too prescriptive or not realistic); lack of clinician training in the risks involved, what their alternatives are and the complexity of the judgement required in deciding on the appropriate strategy; budget constraints; availability of interpreters (e.g. the 9 to 5 nature of ‘Language Line’ is of limited use in ED); or underlying (unacknowledged) attitudes of clinicians toward LEP patients.

Other research has found that improving systems, monitoring interpreter use and training in interpreter use increase the rates of usage of interpreters. Such measures, especially the training of clinicians in the complexity of the issues surrounding communication with LEP patients, would be useful since this study suggests that awareness of policy and of how to obtain interpreters, and even of the increased clinical risk in the situation, is not sufficient to change clinician behaviour.
Competing interests: None.

Author information: Ben Gray, Senior Lecturer, Department of Primary Health Care and General Practice, Otago University Wellington School of Medicine and Health Sciences, Wellington; James Stanley, Research Fellow (Biostatistician), Dean’s Department, Otago University Wellington School of Medicine and Health Sciences, Wellington; Maria Stubbe, Senior Lecturer/Senior Research Fellow, Department of Primary Health Care and General Practice, Otago University Wellington School of Medicine and Health Sciences, Wellington; Jo Hilder, Research Fellow, Department of Primary Health Care and General Practice, Otago University Wellington School of Medicine and Health Sciences, Wellington

Acknowledgements: The authors wish to thank Nita Hill for conducting the interviews in Phase 2, and the clinicians who participated in this research.

Correspondence: Dr Ben Gray FRNZCGP, Senior Lecturer, Department of Primary Health Care and General Practice, Otago University Wellington School of Medicine and Health Sciences, PO Box 7343, Wellington South, New Zealand. Fax: +64 (0)4 3855539; email: ben.gray@otago.ac.nz

References:


17. Auckland District Health Board. The Interpreter Service.  


Appendix 1. Survey used in Phase 1

<table>
<thead>
<tr>
<th>Research Survey on LEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>1. Which DHB are you working in?</td>
</tr>
<tr>
<td>☐ Capital &amp; Coast DHB</td>
</tr>
<tr>
<td>☐ Hutt Valley DHB</td>
</tr>
<tr>
<td>2. Name (First name then Last name)</td>
</tr>
<tr>
<td>________________________</td>
</tr>
<tr>
<td>3. Position</td>
</tr>
<tr>
<td>☐ Nurse</td>
</tr>
<tr>
<td>☐ Physiotherapist</td>
</tr>
<tr>
<td>☐ Registrar</td>
</tr>
<tr>
<td>☐ Senior Medical officer</td>
</tr>
<tr>
<td>☐ Other (please specify)</td>
</tr>
<tr>
<td>________________________</td>
</tr>
<tr>
<td>4. Gender</td>
</tr>
<tr>
<td>☐ Male</td>
</tr>
<tr>
<td>☐ Female</td>
</tr>
<tr>
<td>5. How Many Years Since Qualification (enter as a number please e.g. 3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Which Ethnic Group do you belong to? (tick as many boxes as apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Chinese</td>
</tr>
<tr>
<td>☐ Cook Island Maori</td>
</tr>
<tr>
<td>☐ Indian</td>
</tr>
<tr>
<td>☐ Maori</td>
</tr>
<tr>
<td>☐ New Zealand European</td>
</tr>
<tr>
<td>☐ Niuean</td>
</tr>
<tr>
<td>☐ Samoan</td>
</tr>
<tr>
<td>☐ Tongan</td>
</tr>
<tr>
<td>Others (please specify)</td>
</tr>
<tr>
<td>________________________</td>
</tr>
</tbody>
</table>

| 2.                     |
## Research Survey on LEP

7. **What Language(s) did you grow up with?**
- Cantonese
- Cook Island Maori
- English
- Gujarati
- Hindi
- Mandarin
- Maori
- Niuean
- Samoan
- Tongan
- Others (please specify)

8. **What other language(s) do you speak fluently?**
- Cantonese
- Cook Island Maori
- English
- Gujarati
- Hindi
- Mandarin
- Maori
- Niuean
- Samoan
- Tongan
- Others (please specify)

9. **What Languages do you use during consultations?**
- Cantonese
- Cook Island Maori
- English
- Gujarati
- Hindi
- Mandarin
- Maori
- Niuean
- Samoan
- Tongan
- Others (please specify)

10. **How often do you see patients with Limited English Proficiency (LEP)? Please answer either daily, weekly or monthly.**

For the purpose of this survey, a patient with Limited English Proficiency is defined as a person for whom English is not their first language AND whose level of English limits the extent of communication in the consultation. This group includes 1) Speakers with very little English, such that consultation is not possible without an interpreter OR 2) Speakers with some English but insufficient English to conduct a comprehensive consultation.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>Monthly</td>
<td></td>
</tr>
</tbody>
</table>
### Research Survey on LEP

11. When you see a patient with Limited English Proficiency (LEP) do you use an interpreter?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Never</th>
<th>About Half</th>
<th>Always</th>
</tr>
</thead>
</table>

3. 

12. Do you use a professional interpreter (paid by the DHB)?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Never</th>
<th>About Half</th>
<th>Always</th>
</tr>
</thead>
</table>

13. Are you aware of the DHB Policy on Interpreters

- No
- Yes

14. Do you know how to access a professional interpreter if you need one?

- No
- Yes

15. Communication difficulties are common when consulting with Limited English Proficiency (LEP) patients.

Do you think these difficulties significantly affect your care of LEP patients?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Never</th>
<th>About Half</th>
<th>Always</th>
</tr>
</thead>
</table>
Appendix 2. Questionnaire used in Phase 2

Does communication difficulty with Limited English Patients increase physician assessed likelihood of adverse outcome?

1. Was this the first time you had seen this patient? (1) yes (2) no

2. What was the complexity of the consultation?

<table>
<thead>
<tr>
<th>1. Simple</th>
<th>2.</th>
<th>3. Moderate</th>
<th>4.</th>
<th>5. Complex</th>
</tr>
</thead>
</table>

3. Were there communication difficulties? (a) Yes (b) No

4. If yes what were the nature of these difficulties?

5. If communication difficulties were present how did you identify this?

6. Was there extra clinical risk as a result of the communication difficulties?

   a) Uncertainty as to whether medical terms were understood.

<table>
<thead>
<tr>
<th>1. Minimal</th>
<th>2.</th>
<th>3. Moderate</th>
<th>4.</th>
<th>5. Considerable</th>
</tr>
</thead>
</table>

   b) Uncertainty that treatment regime was understood.

<table>
<thead>
<tr>
<th>1. Minimal</th>
<th>2.</th>
<th>3. Moderate</th>
<th>4.</th>
<th>5. Considerable</th>
</tr>
</thead>
</table>

   c) Uncertainty that informed consent was adequately obtained.

<table>
<thead>
<tr>
<th>1. Minimal</th>
<th>2.</th>
<th>3. Moderate</th>
<th>4.</th>
<th>5. Considerable</th>
</tr>
</thead>
</table>

   d) Part of the history was avoided due to communication difficulty (e.g. sexual history)

<table>
<thead>
<tr>
<th>1. Minimal</th>
<th>2.</th>
<th>3. Moderate</th>
<th>4.</th>
<th>5. Considerable</th>
</tr>
</thead>
</table>

   e) Other

7. How would you describe this patient’s English-speaking Ability?

   a) Native English Speaker or equivalent
   b) Fluent English Speaker (fluent) with some limitations
   c) Speaker with some English but insufficient to conduct comprehensive consultation (intermediate)
   d) Speaker with so little English that a basic consultation is not possible without interpreter (very little)

8. Did you use an Interpreter? (a) Yes (b) No

9. If “Yes”, was this Interpreter

   a) Professional Accredited (e.g Language Line, Wellington Community Interpreters)
   b) Paid not accredited (Some Hospital employed interpreters are not accredited)
   c) Ad Hoc: family member, friend not paid.
10. Was the Interpreter present: (a) in the room or (b) via telephone?

11. If an interpreter was used how was this achieved?:
   
a) Arranged ahead of the appointment  
b) Brought by the patient  
c) Telephone interpreter engaged at the time.

Thank you for your participation
Improving clinician-patient communication of health risks when diagnostic test information is imprecise

John Fountain, Philip Gunby

Abstract

Both clinicians and patients experience difficulty with the statistical reasoning required to make inferences about health states on the basis of information derived from diagnostic tests. This problem will grow in importance as we move into the era of personalised medicine where an increasing supply of imprecise diagnostic tests meets an increasing demand to use such tests on the part of intelligent but statistically innumerate clinicians and patients. We describe a user-friendly, interactive, graphical interface for calculating, visualising, and communicating accurate inferences about uncertain health states when diagnostic information (test sensitivity and specificity, and health state prevalence) is imprecise and ambiguous in its application to a specific patient. The software is free, open-source, and runs on all popular PC operating systems (Windows, Mac, Linux).

A 2004 article in this Journal argues correctly that clinical judgment will always play an important role in the application of diagnostic test results to individual patients. The basic point made there is that because post-test predictive probabilities (obtained via Bayes theorem) rely on measurements that can only be known and applied relatively imprecisely, “clinical judgment” will have to be used to weigh up various sources of imprecision and ambiguity to arrive at point or interval assessments of final health risks for the patient.

But Wong’s concluding inference, that “diagnostic tests are indeed testing of clinicians”, is incomplete in two ways. First, by refusing to open and examine the black box of “clinical judgment”, he understates the real risk assessment and risk communication problems clinicians and their patients face. Second, he ignores the important practical clinical question: what can be done to help clinicians and their patients use “clinical judgment” to resolve the inference and decision making issues created by these ambiguous “testing” tests.

There is a serious problem for clinicians in calculating and interpreting the results of diagnostic test information, even when diagnostic information is precise. Research on the statistical innumeracy of physicians shows that an astonishing 70-75% of medical students, house physicians and practicing physicians cannot correctly calculate the inverse probabilities required to generate post-test predictive probabilities. These statistical innumeracy problems appear to get worse for clinicians the longer the elapsed time since graduation from medical school.

As Gigerenzer puts it, we live in an age of statistical innumeracy, with both clinicians and their patients facing four endemic problems: the illusion of certainty; an ignorance of quantitative risks; an inability to communicate risk information effectively; and clouded thinking about how to use quantitative diagnostic information.
to draw informed conclusions. The inference problems facing statistically challenged clinicians and their patients will become much worse as we enter the era of “personalised medicine”.

The fundamental idea behind personalised medicine involves widespread use of diagnostic tests based on newly discovered genes and proteins to better predict individual patients’ clinical responses to specific drug therapies. The directors of the National Institute of Health (NIH) and The Food and Drug Administration (FDA) in the US are preparing for an explosion in the growth of these kinds of new diagnostic tests. But we also live in an era of “informed consent”, where patients, many of whom are well educated, want to be directly involved in the decision making processes and risk assessments that inform and guide their health care and treatment.

The combination of (1) a rapid increase in the supply of new diagnostic tests, (2) increased demand for these new diagnostics, and (3) intelligent but statistically innumerate clinicians and patients (especially when an understanding and calculation of inverse conditional probabilities (Bayes’ theorem) is required) is a recipe for trouble.

We have developed a software program that may be of use to clinicians and their patients in solving this problem. The program has an interactive visual display specifically designed to facilitate both the understanding and communication of risk information when the underlying information is imprecise. That is, it allows for quick robustness checks (“what-if” reasoning) with immediate visual feedback on relevant uncertainties.

Suppose that a patient in a clinician patient consultation asks: “I am different – older, younger, sicker, healthier, etc - what difference would that make?” The clinician – alone or in consultation with a patient - can easily change relevant input values within reasonable bounds and use the immediate visual feedback to communicate and explore the implications of the patient’s question for post-test positive or negative predictive probabilities.

The display is user-friendly, involving only sliders, menu buttons and input fields. No mathematical sophistication is required or presupposed, so the program can be used by a very wide range of clinicians and patients, from the statistically sophisticated through to the statistically innumerate. While simple and intuitive, the program interface also gives users the ability to verify and analyse different scenarios. This allows patients and clinicians to explore any uncertainty they have about the accuracy and reliability of the diagnostic test results and also about the frequency of medical conditions in the population.

The interface instantaneously generates updated graphs and frequency numbers permitting patients and clinicians to discuss and communicate the risks of treating or not treating any potential medical conditions that patients might have (see Gigerenzer4,5). And last but not least, the software tool itself is free and based on freely available, open source software that can be easily installed and run on all of the popular PC operating systems (Windows, Mac, Linux) used by clinicians and patients.

Figure 1 below is an annotated screenshot of the interface of the program. Once installed, this interface is all that users see. Of course a static, black and white picture cannot do justice to a fully interactive environment with color coding, so we have
developed a short tutorial video\textsuperscript{7} which shows the interface in action. But the general idea about how the interface facilitates diagnostic inferences about health states based on the outcome of both precise and imprecise diagnostic test results is captured in the static screenshots below.

Figure 1 has 3 basic interconnected parts. The left panel consists of user controlled diagnostic input variables. The right panel contains two outputs, one tabular, the other graphical, both derived from the input sliders in the left panel. A brief explanation of each of the panels in Figure 1 is followed by examples in Figure 2 and Figure 3 of how clinicians and their patients can use the software to vary the input parameters and observe the effect on diagnostic inferences in order to apply imprecise estimates to individual patients.

**Figure 1. An annotated picture of the basic interface**

The table in the top right of Figure 1, essentially a logician’s Truth Table for two propositions augmented by natural frequency information, sets out the basic logical possibilities for combinations of health states and test results. The proposition “the
patient has the specific disease” is represented by a binary variable D on the left side of the table, a variable that has two possible values: D=1 if the proposition is true and D=0 if that proposition is false. The proposition “the diagnostic test on this patient is positive for the disease” is represented by a binary variable T on the left side of the table, a variable that can also take on two possible values, T=1 if the proposition is true and the test is positive for the disease, T=0 if the proposition is false and the test is negative (non-positive) for the disease. The four columns of 1’s and 0’s in the table identify the four logically possible combinations for disease states (present, absent) and test outcomes {positive, negative}, each labeled with their conventional epidemiological names.

The frequency information in the bottom row of the Truth Table is a way of expressing uncertainty about the logical possibilities for (D,T) in the form of hypothetical counts of cases in a hypothetical population. The initial default values in the table of Figure 1 assume a population of 100 cases, 16 of which are true positives, four of which are false negatives, 24 of which are false positives, and 56 of which are true negatives.

Empirical research\(^2,5\) demonstrates improved accuracy of reasoning, less clouded thinking, and better understanding and communication of risk information for many (but not all) people when uncertainties are expressed as whole number frequencies in a natural sampling format as compared to using the language of conditional, marginal, and joint probabilities using decimals or percentages. Of course the table can also be used with the language of probability to express uncertainties, since scaling whole number frequencies (the column counts) by dividing by 100 or its multiples is a transparent operation for clinicians or patients familiar with the language of probability.

The initial values for the frequency numbers are controlled by the sliders and menu buttons on the left hand side of Figure 1. These sliders represent numerical inputs for conventional ways of expressing uncertainty about disease states and diagnostic test outcomes: test sensitivity, test specificity, and the base rate or disease prevalence.\(^8\) For example, test sensitivity, the proportion of cases with disease (D=1) among those cases with a positive test outcome (T=1) is 16 out of 16+4=20 in Figure 1, or 80%. Similarly, test specificity is the proportion of cases without the disease (D=0) among those cases with a negative (T=0) test outcome, 24 out of 24+56=70 in Figure 1, or 70%.

The base rate or prevalence of the disease in Figure 1 is the proportion of cases in the population who have the disease (D=1), 16+4=20 out of 100 cases, or 20%. There are actually two rows of frequencies, corresponding to the two sets of sliders in the left panel. Having two sets of sliders and associated frequency representations comes in handy when exploring the implications of imprecise inputs into the inference process.

The graphical display in the bottom right panel of Figure 1 shows the positive (T=1) post-test predictive probabilities (solid red line) and negative (T=0) post-test predictive probabilities (dashed blue line) for having the disease (D=1) for every possible prevalence rate from 0 to 1 along the x-axis. The curves are calculated from Bayes theorem based on the values of the sensitivity and specificity of the test, but the user does not see the calculation.
The vertical line in the figure through 0.2 or 20%, the base rate or prevalence rate of the disease set by the base rate slider, intersects the two post-test predictive probability curves. The upper intersection point identifies the numerical value (0.4) of the predictive probability that the disease is present given a positive diagnostic outcome, denoted \( P(D=1|T=1) \). The notation \( P(D=1|T=1) \) is just a shorthand way of expressing uncertainty about the chances of having the disease, \( D=1 \), when a positive test result, \( T=1 \), is observed.

Reading the symbols from left to right: \( P \) is the probability, representing the degree of uncertainty; \( D=1 \) is what we are uncertain about, we want to know if we have the disease; and \( T=1 \) captures the information we have, we know the test has come back positive. The positive predictive probability \( P(D=1|T=1)=0.4 \) can be calculated by the count of 16 in column 1 where \( D=1 \) and \( T=1 \), divided by 16+24, the sum of the counts associated with \( T=1 \) in columns 1 and 3. The lower intersection point identifies the numerical value (0.07) of the predictive probability that the disease is present given a negative diagnostic outcome, denoted \( P(D=1|T=0) \). This notation \( P(D=1|T=0) \) is just a shorthand way of expressing uncertainty about the chances of a false negative test result.

Analogous to the previous case, \( P \) represents the degree of uncertainty, \( D=1 \) is what we are uncertain about, and \( T=0 \) captures the information we have. The difference is that here the test has come back negative. The negative predictive probability \( P(D=1|T=0)=0.07 \) can be calculated by the count of four in column 2 where \( D=1 \) and \( T=0 \), divided by 4+56=60, the sum of the counts associated with \( T=0 \) in columns 2 and 4. The specific numeric values shown in Figure 1 are derived from the slider settings, which simultaneously determine the counts in the columns of the natural frequency table.

Figure 2 below shows the impact on post-test predictive probabilities of decreasing the base rate from 20% to 5% when test sensitivity and specificity remain unchanged. As the base rate slider is manipulated, the position of the vertical line changes (with a thinner, more opaque line keeping the original base rate at a benchmark level for comparison purposes). In the example of Figure 2 both post-test predictive probabilities decrease with the decreases in the base rate, and markedly so, from 40% to 12%, for the positive predictive probability.

Not only are the levels of the new post-test probabilities instantly recalculated on the graph as the base rate slider is manipulated, but the changing difference between the two post-test probabilities – the vertical gap between the two curves – is transparent. The vertical gap at any specification of the base rate is a measure of the amount of information to be gained from actually doing a diagnostic test.

Since diagnostic tests are usually costly in time and resources, if not also in the downstream implications of reacting to false positives (anxiety and further unnecessary interventions) and not reacting to false negatives (misplaced assurance and foregone helpful interventions), it is helpful to have an idea of “how much” or “how little” information one can expect to learn from a tests before any test is actually performed. The vertical gap between the solid and the dashed curves provides one such measure. When the gap between the solid and dashed lines at relevant pre-test prevalence rates is small, it may not be worthwhile undergoing costly and risky testing in the first place, an important message to get across to patients eager for
subsidised diagnostic tests. There are various combinations of sensitivity, specificity, and pre-test base rate that can lead to small differences between the post-test predictive probabilities, all of which can easily be explored with the interface.

Figure 2 itself illustrates a very general principal that the gap between post-test predictive probabilities—and therefore the additional information provided by a diagnostic test - will be small whenever the base rate or prevalence of the condition D=1 is either very small or very large. The truth table in Figure 2 helps explain why. For example at a low prevalence rate or pre-test probability of 5% (the patient is unlikely to have the disease) many of the positive test results (29 out of 4+29=33 from columns 1 and 3 of the table) will be false positives.

Figure 2. Exploring the effects of changing the base rate keeping test sensitivity and specificity unchanged

The sensitivity and specificity values used for the calculations underlying Figures 1 and 2 are low, 80% and 70% respectively. What if the test was more (or less) sensitive or more (or less) specific, or more or less on both counts? The software tool can be
used to investigate all of these combinations quickly and correctly. Figure 3 shows the impact of one pair of those changes. Test sensitivity and test specificity are now each close to 95%.

Notice that the positive predictive probability (what to infer from a positive test result) now increases above 80% for all but the lowest base rates for diseases, and approaches probabilities of 95% when the pre-test probabilities are greater than 50/50 or 50%. Similarly the negative predictive probability (what to infer from a negative test result) decreases to less than 20% for all but the highest prevalence rates, and to less than 5% for all pre-test probabilities lower than 50/50 or 50%.

Overall the gap between two curves has increased dramatically (in comparison to the lower sensitivity and specificity in the benchmark case). This reveals that the diagnostic test has more discriminatory power when test sensitivity and specificity are improved, and therefore testing may be more worthwhile performing.

**Figure 3. Exploring the effects of changing the test sensitivity and specificity keeping the base rate unchanged**
Of course other combinations of sensitivity and specificity can easily be explored. For example, there is often a tradeoff between sensitivity and specificity when disagreements arise about setting the threshold levels for classifying test results.5,9 This tradeoff can easily be explored – and explained to interested patients - using sliders in the software interface software tool interface. Once a clinician masters the interface (a very straightforward task as illustrated in the web tutorials) he or she can use it to communicate in easily understandable way with a patient about how relatively imprecise or ambiguous information about that patient and the testing procedure might impact on their post-test chances of having a disease.

The format that we present can be seen as a logical extension of Gerd Gigerenzer’s insight as to why natural frequency formats help people make better inferences from diagnostic information in uncertain situations: “the representation does part of the reasoning” (p48).5

We have augmented the standard natural frequency representation of inference task problems in three ways that are useful for clinicians and patients. First, our interface in a compatible way with standard clinical ways of representing and communicating uncertainties about health risks and diagnostic tests (sensitivity, specificity, and base rate). Second, all calculations and the many recalculations that are necessary when exploring the implications (for post-test health risks) of imprecision and ambiguities in underlying information sources, are done electronically and correctly. Thirdly, the interactive graphical interface provides visually clear and immediate, dynamically updated representations of both inputs to and outputs for the inference task, with an ability to check (via the natural frequency table) relevant calculations and gain understanding into how diagnostic information and health state risks are related. As Edward Tufte says:

“…clarity and excellence in thinking is very much like the clarity and excellence in the display of data. When principles of design replicate the principles of thought, the act of arranging information becomes an act of insight”10

Competing interests: None.

Author information: John Fountain, Senior Lecturer; Philip Gunby, Senior Lecturer; Department of Economics, University of Canterbury, Christchurch

Correspondence: John Fountain, Senior Lecturer, Department of Economics, University of Canterbury, Private Bag 4800, Christchurch 8140, New Zealand. Fax: +64 (0)3 3642635; email: john.fountain@canterbury.ac.nz

References:

Compliance and quality in administration of a surgical safety checklist in a tertiary New Zealand hospital

Nicole Vogts, Jacqueline A Hannam, Alan F Merry, Simon J Mitchell

Abstract

Aim Recent studies have demonstrated a reduction in perioperative complications if a surgical safety checklist is utilised. In our institution an adaptation of the WHO Surgical Safety Checklist is administered in 3 “domains”: on arrival of the patient in the operating room (Sign In); before surgical incision (Time Out) and before the patient leaves the operating room (Sign Out). Since incomplete administration or staff disengagement could diminish any safety benefit we evaluated administration of this checklist.

Method 100 adult surgical cases were observed. Compliance with administration of the Sign In, Time Out, and Sign Out domains and their component checklist items was recorded. The timing of the checklist administration, and engagement of operating room teams were also assessed.

Results The rate (per 100 cases) of the checklist domain administration was: 99 for Sign In; 94 for Time Out; and 2 for Sign Out. The mean (range) checklist item compliance was 56% (27–100%) for Sign In, 69% (33–100%) for Time Out, and 40% for Sign Out. Checklist items related to patient identity and surgical procedure were administered in 100% of Sign In administrations. Timing of the checklist administration was appropriate in over 80% of cases. Engagement by theatre teams was frequently incomplete.

Conclusion The Sign Out domain was almost always omitted, which may increase the risk of important omissions in postoperative care. Most other aspects of checklist administration could also be improved. This will require strong leadership from senior clinicians in all relevant teams.

The incidence of preventable adverse events in the operating room (OR) is well documented.1–4 Globally, more than 200,000,000 operative procedures are estimated to take place per year and it follows that the impact of surgery-related adverse events is substantial.5

The World Health Organization (WHO) Safe Surgery Saves Lives Challenge began in 2006 with the aim of developing global guidelines to promote patient safety in the OR and following operative procedures.6 From these guidelines, the WHO Surgical Safety Checklist was developed to address preventable adverse events in the OR setting.

Safety checklists are already in use in the medical setting,7 and are well established in other high risk professions: aviation is a clear example. However, the WHO Surgical Safety Checklist advances standard perioperative checklist practices in several key ways. First, it is administered in the OR, not in the preoperative area as has often been the case. Second, it is administered at three strategic points: on patient arrival but
before any intervention (“Sign In”); immediately before surgical incision (“Time Out”); and before team members or the patient leaves the OR (“Sign Out”). Finally, it is specifically designed to promote communication and teamwork within the OR.

A multi-centre international study comparing patient outcomes before and after implementation of the WHO Surgical Safety Checklist showed a significant overall reduction in postoperative complications and mortality. These findings were replicated in a recent multicentre prospective trial of an analogous system to improve surgical safety in the Netherlands.

Auckland City Hospital was one of the study sites in the initial WHO Surgical Safety Checklist study, and an adapted form of the checklist has since been part of standard OR practice (Figure 1). However, checklist use and compliance has not been evaluated in the two years since the study.

Appropriate use of the WHO Surgical Safety Checklist constitutes more than item verbalisation; it requires verification of the listed items by various OR team members, correct timing of domain administration and the involvement and attention of all team members throughout. Incomplete or inconsistent checklist administration may diminish the potential for improvement in patient safety identified by the relevant studies.

In institutions where the WHO Surgical Safety Checklist is employed, future studies of preventable patient harm following operative procedures should be interpreted in the context of the quality of checklist administration. The aim of this study was to determine the contemporary quality of administration of our institutions’ adaptation of the WHO Surgical Safety Checklist in ORs at Auckland City Hospital.

**Methods**

**Study design**—The study was approved by the Northern Y Regional Ethics Committee (ref: NTY/10/EXP/077) and was listed with the Australian New Zealand Clinical Trials Registry (ref: ACTRN12610001070022). The study was also discussed with and approved by senior OR management, and announced to a general meeting of OR staff in advance. This was a prospective investigation of current practices in the administration of the adapted version of the WHO Surgical Safety Checklist at Auckland City Hospital, undertaken during November and December 2010. One hundred adult surgical procedures were directly observed. At the start of each study day, the observer was allocated to an OR by the attending Anaesthetic Coordinator. Where operating lists finished early, observation was transferred to a second OR. Observations took place during weekday shifts and all acute and elective procedures were eligible.

**Data collection**—The observer (NV) attended operating lists primarily as a medical student with the agreement of the attending anaesthetist. This ensured observation was discrete and reduced potential for changes in theatre staff behaviour as a result of the observation itself. Surgical specialty and operative procedure were documented, but no identifying information relating to patients, theatre staff or OR was collected. Data were recorded using a standardised WHO Surgical Safety Checklist compliance assessment tool (Appendix 1), which was developed from the adapted version of the WHO Surgical Safety Checklist currently used in all theatres at Auckland City Hospital (Figure 1). The compliance assessment tool also includes items from the original WHO Surgical Safety Checklist that are not included in the current Auckland City Hospital version. This was intentional, so that the tool could be adopted for use in institutions that use this original version. Any redundant items in the tool were ignored by the observer in the present study.

The compliance assessment tool is divided into three domains (Sign In, Time Out and Sign Out) corresponding to those of the WHO Surgical Safety Checklist. Compliance (or non-compliance) with administration of individual items of the checklist was recorded. Compliance was defined as verbal communication of the item by the checklist administrator (commonly a circulating theatre nurse in our
institution) or by other members of the OR team during administration of the checklist. Items of the checklist that were performed or communicated between team members outside of checklist administration did not constitute compliance with that item.

**Figure 1. Adapted WHO Surgical Safety Checklist in current use at Auckland City Hospital**
In addition to compliance with individual items, the timing of administration and the engagement of team members were recorded for each domain. Engagement was defined as the cessation of all other activities and conversation, with focus on communicating the checklist. Engagement was scored according to the number of the three theatre teams (surgical, nursing and anaesthesia) that were engaged in checklist administration: engagement of at least one team member constituted team engagement. If a team was not present for administration of a checklist domain, this was recorded as non-engagement but any expected absences are qualified in the results.

**Data quality**—The observer received training during a 2-week setup phase immediately prior to study commencement and completed the compliance assessment tool for four operating lists during this period. Throughout the data collection phase, one operating list per week was attended by a second observer (JH) who independently observed the same cases for assessment of inter-observer reliability. In ten percent of cases, the completed compliance assessment tool was randomly allocated for re-entry to assess data entry accuracy.

**Analysis**—The primary outcome was the administration rate (per 100 cases) of the three domains (Sign In, Time Out and Sign Out) and the percentage of cases, by domain, in which its individual checklist items (Figure 1) was administered. Any items that were not applicable to a particular case were excluded from the analysis. Secondary outcomes were engagement of team members during domain administration and timing of domain administration. Domain item compliance was calculated as the proportion of completed individual domain items to the total number of items in that domain. Domain item compliance was expressed as a percentage for each case, and the mean (range) across all audited cases.

**Results**

Forty-six acute cases and 54 elective cases were audited during the study period. The casemix of surgical specialities audited is given in Table 1.

**Table 1. Surgical specialty casemix for the 100 study cases**

<table>
<thead>
<tr>
<th>Surgical specialty</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal</td>
<td>8</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>1</td>
</tr>
<tr>
<td>General</td>
<td>23</td>
</tr>
<tr>
<td>Head Neck and Breast</td>
<td>11</td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>13</td>
</tr>
<tr>
<td>Upper gastrointestinal (GI)</td>
<td>11</td>
</tr>
<tr>
<td>Urology</td>
<td>23</td>
</tr>
<tr>
<td>Vascular</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Primary outcomes**—The rate (per 100 cases) of checklist domain administration was: 99 for Sign In; 94 for Time Out; and two for Sign Out. The mean (range) domain item compliance was 56% (27–100%) for Sign In, 69% (33–100%) for Time Out, and 40% for Sign Out. Compliance with individual domain items is given in Table 2. There was 100% compliance with statement of patient identity and, although not specified by the checklist, this was confirmed by inspection of patient wristband in 98% of cases.

Communication with patients to confirm their identity occurred in 30% of cases. High compliance scores were also achieved for the checklist items pertaining to operative procedure type (99%), verification of patient consent (96%) and statement of patient
allergies (95%). The item pertaining to patient allergies prompted acknowledgement from the anaesthetic team in 23% of these cases; acknowledgment by members of the surgical team did not occur in any of the 17% of cases for which they were present during completion of this item.

The checklist item stating availability of blood products was acknowledged by the anaesthetist in 38% of the cases in which it was completed. In those cases where Time Out was completed, 74% involved some form of team member introductions. Of these: 1% involved full introduction of members by name and role; 72% involved naming of team members only; and 27% involved verbal acknowledgement by the checklist administrator that the team already knew each other.

Table 2. Compliance with administration of items of the Auckland Hospital adaptation of the WHO Safe Surgical Checklist

<table>
<thead>
<tr>
<th>SIGN IN (n=99)</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's identity stated and agreed</td>
<td>100%</td>
</tr>
<tr>
<td>Patient's surgical site stated and agreed</td>
<td>94%</td>
</tr>
<tr>
<td>The surgical site marking is checked if applicable</td>
<td>33%</td>
</tr>
<tr>
<td>The patient's procedure stated and agreed</td>
<td>99%</td>
</tr>
<tr>
<td>Patient's consent stated and verified</td>
<td>96%</td>
</tr>
<tr>
<td>Presence or absence of allergy stated</td>
<td>95%</td>
</tr>
<tr>
<td>Availability of surgeon verified</td>
<td>23%</td>
</tr>
<tr>
<td>Blood availability stated</td>
<td>81%</td>
</tr>
<tr>
<td>Question about complex airway problem asked and anaesthetist responds</td>
<td>26%</td>
</tr>
<tr>
<td>Question about anaesthetic machine asked and anaesthetist responds</td>
<td>20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME OUT (n=94)</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of team members</td>
<td>74%</td>
</tr>
<tr>
<td>Patient's identity stated and agreed</td>
<td>100%</td>
</tr>
<tr>
<td>Patient's surgical site stated and agreed</td>
<td>96%</td>
</tr>
<tr>
<td>Patient's procedure stated and agreed</td>
<td>100%</td>
</tr>
<tr>
<td>Appropriateness of positioning confirmed</td>
<td>77%</td>
</tr>
<tr>
<td>Presence of correct imaging confirmed</td>
<td>16%</td>
</tr>
<tr>
<td>Surgeon enumerates or denies any anticipated critical events</td>
<td>90%</td>
</tr>
<tr>
<td>Anaesthetist enumerates or denies any anticipated critical events</td>
<td>78%</td>
</tr>
<tr>
<td>Nursing staff enumerate or deny any anticipated critical events</td>
<td>3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIGN OUT (n=2)</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of procedure is stated as recorded</td>
<td>50%</td>
</tr>
<tr>
<td>Confirmation that the specimen (if any) is correctly labelled</td>
<td>50%</td>
</tr>
<tr>
<td>Surgeon enumerates or denies any key concerns for the recovery and care of the patient</td>
<td>50%</td>
</tr>
<tr>
<td>Anaesthetist enumerates or denies any key concerns for the recovery and care of the patient</td>
<td>0%</td>
</tr>
<tr>
<td>Nursing staff enumerate or deny any key concerns for the recovery and care of the patient</td>
<td>0%</td>
</tr>
</tbody>
</table>

Secondary outcomes—OR team engagement during Sign In consisted of all three teams (surgical, nursing and anaesthesia) in 3% of cases, two teams in 52% and one team in 45%. Interpretation of these data must take account of the frequent and accepted absence of the surgical team at Sign In. They were present in only in 17% of cases.

Engagement during Time Out consisted of the entire theatre team in 15% of cases, at least one member of all three teams in 38% of cases, two teams in 35% and one team in 12%. In one of the two cases where Sign Out administration was observed, two
teams were engaged and in the other, one team was engaged. Sign In was performed before drug intervention in 79% of cases, and Time Out was performed before skin incision in 90% of cases. Both instances of Sign Out domain completion occurred before the surgical team left the OR.

**Data quality**—Eighteen cases were assessed by two independent observers to measure inter-observer reliability. This produced 657 assessable data points, of which 96% were concordant. Re-entry of 10% of cases to evaluate data entry quality produced 100% accuracy for the resultant 450 data points.

**Discussion**

This study, conducted in a major adult surgical operating room suite, found that the prescribed checklist was invariably utilised but often incompletely. There was a high rate of administration of the Sign In and Time Out domains within which the best compliance was with items relating to patient identity, procedure, consent and, where valid, side or site of operation. These are arguably amongst the most important checks present on the list as they target wrong-side, wrong-patient, wrong-procedure errors all of which are capable of causing serious harm and are entirely preventable.\(^\text{10}\)

In contrast, Sign Out was rarely performed. This omission appears to be accepted as standard in the ORs included in this study. A potential reason for the poor compliance with this domain is confusion around its proper timing. The correct timing is defined as ‘before the surgeons leave the OR’ and therefore, unlike the other domains, it is not linked to a specific event in patient management. Furthermore, in our institution the checklist is primarily performed by the nursing team whose members have a number of responsibilities at the end of a surgical procedure, such as completion of final instrument count. This may also interfere with Sign Out administration. The components of the Sign Out, such as concerns for handover of the patient, represent an important part of the theatre dialogue which may not occur when this domain is omitted.

These findings are consistent with a recent study in British hospitals which found that Sign Out was completed less commonly than the other domains.\(^\text{11}\) It also found that overall administration of checklist items declined dramatically after the initial observed introduction period. The potential causes of less rigorous checklist administration are multiple. The routine nature of the checklist’s use may result in indifference towards it and thus less thorough administration. This may be compounded by the multiple protocols already present in the OR – leading to ‘checklist fatigue’. Furthermore, the time-pressured nature of the OR environment may lead to superficial or hurried safety checks.

It must be acknowledged that failure to administer an item during administration of the checklist does not invariably mean that an equivalent safety check was not conducted. For example, communication of the availability of the surgeon prior to induction occurred almost universally during this audit despite poor rates of administration of this item during Sign In (Table 2). However, the role of the checklist is to standardise checks and it should not be replaced by these practices but rather supplement and formalise them.
A key objective of the WHO Surgical Safety Checklist is improvement of team communication, which corresponds to one of the ten objectives of the WHO guidelines for safe surgery.\textsuperscript{6} The role of checklists in promoting communication in the OR has been documented.\textsuperscript{12} The WHO Surgical Safety Checklist is designed to actively promote such communication; all domains are administered in the OR while the patient is present, and Time Out includes the introduction of all team members by name and role.

The findings of this study relating to team communication and the checklist were interesting. The introduction of team members’ names, arguably the most important communication-enabling measure, was appropriately undertaken in many theatres. Nevertheless, communication was often poor around other items. For example, while checklist items involving statement of allergy and blood availability were administered in a high proportion of cases (Table 2), an acknowledgement from the anaesthesia and surgical team was uncommon.

Moreover, despite the emphasis on communication, some items specifically framed as questions rather than statements in order to promote response were often either not administered, not acknowledged, or only grudgingly acknowledged. For example, the least performed items in Sign In were the questions directed at the anaesthesia team regarding the potential for a complex airway and whether anaesthetic machine checks had been completed. The observer noted that, when administered, these items often resulted in abrupt answers or no acknowledgement from the anaesthesia team.

One explanation for this may lie in the possibility that checklists can evoke animosity where health professionals feel their individual clinical judgement is threatened or that use of a checklist implies inadequate memory or skill.\textsuperscript{7} Such emotions would be likely in the OR suite audited here. It is served by highly qualified anaesthesia technicians for whom highly detailed anaesthetic machine checks are culturally ingrained, and airway evaluation is similarly embedded in anaesthetic practice. Whatever the cause of antipathy to these questions, repeated unsatisfactory responses would make checklist administrators more inclined to ignore the item leading to the low compliance we measured here.

Engagement of the OR teams, which involved cessation of activity and focus on the checklist, was another indicator of team communication. The failure of team members to pay attention to the checklist has multiple potential consequences. It can result in the failure of communication of important case-specific information and may propagate disregard for the checklist itself, particularly if team leaders are disengaged. Simultaneous engagement of all three teams infrequently occurred for Sign In, primarily due to the usual absence of the surgical team at this time.

Three team engagement at Time Out (when all teams were invariably present) was observed in just over 50\% of cases. Failures in this regard were usually due to preoccupation with other tasks on the part of the surgical and anaesthetic teams. This is clearly an area where improvement could be made. Leadership by senior team members is important. In addition, the assertiveness of the checklist administrator strongly influenced team engagement; if the administrator demanded team attention before commencing administering the checklist higher rates of engagement were achieved.
There are several limitations to this study. Allocation of the observer to operating theatres was not randomised as originally intended. This proved impractical because allocation to low throughput theatres would have resulted in failure to finish the study within the period of the observer’s availability. High-turnover theatres were given preference and this means that specialties such as neurosurgery which have a predominance of longer cases were not represented in the audit. Additionally, the period of observation was limited to two months and thus results may be affected by seasonal or annual variation.

Although an attempt was made to keep the observation process discreet by using a medical student expected to be in the OR for educational purposes, the presence of an observer in the theatre may have altered performance. It is most likely this would have biased the behaviour of staff toward more thorough application of the checklist. Finally, the effects of discrepancies in administration of the checklist on patient safety were not examined in this study but would be important in confirming the significance of our findings.

In conclusion, since its introduction to Auckland City Hospital the local adaptation of the WHO Surgical Safety Checklist has become almost universally adopted. However, the Sign Out domain is virtually always omitted. Moreover, not all items of the checklist are performed with equal frequency, with checks around patient identity and procedure occurring most often, and checks around complex airway issues and anaesthetic machine preparation occurring least often. Inadequacies have also been identified in the timing of checks and in engagement of team members.

These findings are important as it is plausible that imperfect administration of the checklist will result in a loss of the patient safety benefit previously shown to be accrued from its use. It is recommended that regular references to quality of administration of the checklist be made at in-service education meetings for all OR teams, that the checklist be administered by a senior nurse in the OR, and that senior members of all related departments be urged to recognise the crucial leadership role they play in ensuring high quality practice; without their example, poor practices will inevitably become prevalent.

**Competing interests:** AFM was the anaesthesia lead in the WHO Safe Surgery Saves Lives initiative, and is Chair of the Board of the Health Quality and Safety Commission.

**Author information:** Nicole Vogts, Trainee Intern¹; Jacqueline A Hannam, PhD Candidate¹; Alan F Merry, Professor¹,²; Simon J Mitchell, Associate Professor¹,²

¹University of Auckland, Auckland
²Auckland City Hospital, Auckland

**Acknowledgements:** This study was supported by a grant from the Australia and New Zealand College of Anaesthetists. We also thank Martin Zammert for his help with design of the checklist compliance and quality assessment tool.

**Correspondence:** Simon J Mitchell, Department of Anaesthesiology, Faculty of Medical and Health Sciences, University of Auckland, Private Bag 92019, Auckland 1142, New Zealand. Fax: +64 (0)9 3737970; email: sj.mitchell@auckland.ac.nz
References:


Appendix 1. The checklist compliance and quality assessment tool

<table>
<thead>
<tr>
<th>SIGN IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's identity stated and agreed</td>
</tr>
<tr>
<td>− Patient's wristband checked</td>
</tr>
<tr>
<td>− Communication with patient regarding identity if they are alert</td>
</tr>
<tr>
<td>Patient's surgical site stated and agreed</td>
</tr>
<tr>
<td>The surgical site marking is checked or site marking is not applicable</td>
</tr>
<tr>
<td>Patient's consent stated and verified</td>
</tr>
<tr>
<td>Presence or absence of allergy stated</td>
</tr>
<tr>
<td>− Anaesthetist acknowledges presence or absence of allergy</td>
</tr>
<tr>
<td>− Surgeon acknowledges presence or absence of allergy</td>
</tr>
<tr>
<td>Availability of surgeon verified</td>
</tr>
<tr>
<td>If a prosthesis or special equipment is required, it has been checked and presence confirmed</td>
</tr>
<tr>
<td>Blood availability stated</td>
</tr>
<tr>
<td>− Anaesthetist responds appropriately to statement about blood availability</td>
</tr>
<tr>
<td>Question about complex airway problem asked and anaesthetist responds</td>
</tr>
<tr>
<td>Question about anaesthetic machine asked and a member of the anaesthetic team responds</td>
</tr>
<tr>
<td>Presence of functioning pulse oximeter verified</td>
</tr>
<tr>
<td>Timing</td>
</tr>
<tr>
<td>− Administered on arrival in OR before any drug intervention</td>
</tr>
<tr>
<td>− Administered in OR before induction but preceded by drug intervention</td>
</tr>
<tr>
<td>− Not administered in OR</td>
</tr>
<tr>
<td>Engagement</td>
</tr>
<tr>
<td>− Entire theatre team present and engaged</td>
</tr>
<tr>
<td>− At least one member of each of the surgical, anaesthetic and nursing teams engaged</td>
</tr>
<tr>
<td>− Two of the three (surgical, anaesthetic and nursing) teams engaged^</td>
</tr>
<tr>
<td>− One of the three (surgical, anaesthetic and nursing) teams engaged</td>
</tr>
</tbody>
</table>

| TIME OUT                                     |
| Introduction:                               |
|   − All team members introduced by name and role |
|   − Team members introduced by name only     |
|   − No introduction                          |
|   − Administrator acknowledges that the team already knows each other |
| Patient's identity stated and agreed         |
| Patient's wristband checked                 |
| Communication with patient regarding identity if they are alert |
| Patient's surgical site stated and agreed    |
| The surgical site marking is checked or site marking is not applicable |
| Patient's procedure stated and agreed        |
| Appropriateness of positioning confirmed     |
| Presence of correct imaging confirmed       |
| Confirmation that prophylactic antibiotics have been administered ≤ 60 before incision or that antibiotics are not indicated |
| Confirmation that post-operative thrombo-prophylaxis has been ordered if appropriate |
| Anticipated critical events reviewed:        |
|   − Surgeon enumerates or denies            |
|   − Anaesthetist enumerates or denies any anticipated critical events |
|   − Nursing staff enumerates or denies any anticipated critical events |
### Timing
- Administered prior to knife-to-skin
- Administered after to knife-to-skin
- Not administered

### Engagement
- Entire theatre team present and engaged
- At least one member of each of the surgical, anaesthetic and nursing teams engaged
- Two of the three (surgical, anaesthetic and nursing) teams engaged
- One of the three (surgical, anaesthetic and nursing) teams engaged

### SIGN OUT

#### Name of procedure is stated as recorded

#### Confirmation that the specimen (if any) is correctly labelled

#### Correct count verified

#### Key concerns for the recovery and care of the patient reviewed:
- Surgeon enumerates or denies (any key concerns)
- Anaesthetist enumerates or denies (any key concerns)
- Nursing staff enumerates or denies (any key concerns)

#### Problems with equipment discussed

### Timing
- Administered at the end of surgery before the surgical team has left the theatre
- Administered at end of surgery, but surgeons have left the theatre
- Not administered in OR

### Engagement
- Entire theatre team present and engaged
- At least one member of each of the surgical, anaesthetic and nursing teams engaged
- Two of the three (surgical, anaesthetic and nursing) teams engaged
- One of the three (surgical, anaesthetic and nursing) teams engaged
The financial impact of clinical task substitution between practice nurses and GPs in New Zealand primary care centres

Martin Hefford, Tom Love, Jacqueline Cumming, Mary Finlayson, Antony Raymont

Abstract

Aim To describe the financial impact on practice owners of increased clinical task substitution between practice nurses and GPs in New Zealand (NZ) primary care settings.

Method Case studies of 9 primary health care centres involving: interviews; collation of service and financial information; and nurse and GP diaries covering 1826 consultations. Results were compared with previous NZ large N survey results to develop a model predicting the financial impact of task substitution.

Results The proportion of general practice primary care consultations undertaken by nurses varied from 4% to 46% of total recorded consultations. The actual financial impact for a practice owner of substituting more nursing time for GP time is highly dependent on the following variables: nurse cost per minute relative to GP cost minute; nurse consult duration relative to GP consult duration; nurse consult revenue relative to GP consult revenue; and the proportion of nurse consults also requiring GP time.

Conclusion Practice nurses can (and in some practices in NZ, do) provide a broad set of primary care services, including undifferentiated general consultations. For some practices, increasing the proportion of nurse consults and reducing GP consults, would result in significantly improved profitability—for others, the opposite applies. Clinical task substitution is one option to address the forecast increase in demand associated with population aging.

General practitioners in New Zealand (NZ) are ageing and increasingly preferring to work part time.\(^1\) One result has been that patients in some areas of NZ have been unable to enrol with a primary care practice for ongoing care, or have had difficulty obtaining same/next day access once enrolled.\(^2\)

Statistics NZ forecasts that the population aged over 65 years will increase from 550,000 in 2009 to 1 million in the late 2020s. Given that mean primary care consultation rates among those over 65 are more than twice those for the 25–44 year age group (8.6 visits per year versus 3.1) the likely impact on GP workloads (or on access to care) is significant.\(^3,4\)

*The New Zealand Primary Health Care Strategy* was intended to help address this by encouraging more multidisciplinary team-based models of care—but, in practice, the extent to which models of care have changed is highly variable.\(^5,7\)
Commentators have argued that primary care centres that delegate a higher proportion of clinical work to practice nurses can provide access for larger enrolled populations with the same GP workforce. One of the barriers to achieving this may be the perceived or actual financial consequences of increasing the ratio of nurse to GP time.

This study was commissioned by the previous Chief Nurse of the Ministry of Health, who, in discussing these issues with GPs had repeatedly heard the view that primary care practices are better off hiring another GP associate than another nurse, because GP associates had a wider scope of work and generated more income.

A major aim of the study was to develop a financial model that replicated key features of the NZ primary care financial environment, so as to determine the financial impact on practice owners of delegating clinical tasks (especially consultations) from GPs to practice nurses. Such a model could usefully inform practice owners’ decisions on employment of clinical staff and associated models of care.

Method

We employed a mixed methods approach, including:

- Literature review—to identify previously revealed differences in the cost and effectiveness of nurse versus GP provision of specific primary care services;
- Analysis of NZ-based quantitative studies—to derive average values for key variables (e.g. average consultation length) from NZ studies with a sufficiently large sample size;
- In-depth case studies of 9 primary care practices—to obtain a more in-depth understanding of the way tasks are allocated between nurses and doctors in different types of primary care centres (rural/urban, small/large, high nurse users/low nurse users, low cost access/normal capitation), and to provide data to replicate the financial environment for NZ primary care practices.

The case studies involved face to face interviews with GP, nursing and practice management staff; collection of practice revenue and expenses data; collation of population and service utilisation information; collection by GPs and nurses of work diaries over a period of a week; and collection of patient co-payment data. Case studies were completed in August to November 2009. Diaries detailing a total of 1,826 GP and nurse consultations were completed.

Results

Figure 1 shows the percentage of general consults (i.e. excluding immunisations and scripts) undertaken by nurses. The variation in practice is considerable, and is consistent with the interview data showing that nurses have considerably greater clinical autonomy in some practices compared to others.

We developed a simplified customisable model to replicate the impact of NZ wage rates, capitation rates, co-payment charges, and other fee-for-service income on practice profitability under different allocations of the various types of consultations between practice nurses and GPs.

The financial impact for a practice owner of substituting more nursing time for GP time is highly dependent on four variables, as shown in Table 1 below.
Figure 1. Percentage of general consults (i.e. excluding immunisations and scripts) undertaken by nurses

Table 1 Key variables impacting on the cost-effectiveness of clinical task substitution in NZ practices

<table>
<thead>
<tr>
<th>Variable</th>
<th>Notes on impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse cost per clinical minute relative to GP cost per clinical minute</td>
<td>Cost per clinical minute is driven primarily by salary/hourly rates of pay, but is also a function of the amount of paid non-clinical time, including annual leave, CME leave, and protected non-clinical time. This last variable had a significant impact in the practices that used the DHB Multi-Employer Contract Agreement for salaried medical staff—pushing the cost per clinical minute up by around 30%. The lower the nurse cost per minute is as a percentage of the GP cost per minute, the more likely task substitution will be cost-effective (all other things being equal). In our case studies the nurse cost per minute ranged from 21% to 44% of the GP cost per minute.</td>
</tr>
<tr>
<td>Nurse consult duration relative to GP consult duration</td>
<td>The literature review identified that nurse consultations are generally longer than GP consultations for similar clinical issues—although in our case studies the median consultation length for both GPs and nurses from the diaries was 15 minutes. The longer nurse consultations are, relative to GP consultations for the same episode, the less cost-effective task delegation from GPs to nurses becomes.</td>
</tr>
<tr>
<td>Nurse consult fee for service revenue relative to GP consult fee for service revenue</td>
<td>Fee for service revenue includes both patient co-payments and third party payments. ACC, for instance pays less for a nurse consultation than a GP consultation, even if the same clinical service is provided. Immunisations are remunerated at the same level regardless of who provides the service. Most of our case study practices charged patients considerably more for a GP consultation than a nurse consultation. Lower nurse co-payments make task substitution less cost-effective.</td>
</tr>
<tr>
<td>The percentage of nurse consults requiring supplementary GP time</td>
<td>Some primary care consultations, if undertaken primarily by a nurse, will also require GP input—for instance, to confirm the diagnosis and treatment plan, to sign a proposed prescription or to order tests. The more often a nursing consultation also requires GP time, the less cost-effective task substitution will be.</td>
</tr>
</tbody>
</table>
The aggregate impact of the four variables differed considerably between case studies. For some (particularly very low cost access practices), maximal task substitution was always cost-effective. These practices tended to have low levels of fee-for-service revenue and often charged the same or similar amounts whether a patient saw the GP or the nurse.

For more traditional practices the cost-effectiveness of task substitution was more finely balanced. Nurse provision of immunisation and chronic care management services was usually cost-effective, whereas nurse provision of ACC consults usually was not.

The bulk of primary care consultations are undifferentiated ‘general’ consultations; the key variable determining cost-effectiveness for general consultations tended to be nurse co-payment fees as a percentage of GP co-payment fees. Figure 2 shows the projected profitability for case study practice “A”, a non-low cost access practice, under different nurse fee rates (as a % of GP fee) and different proportions of consultations seen by nurses.

The full financial model, which is customisable for different practice configurations, can be downloaded from the NZ Ministry of Health website at http://www.moh.govt.nz/moh.nsf/indexmh/practise-nurse-cost-benefit-analysis

Figure 2. Practice “A” projected profit per thousand population with different percentages of consultations seen by a nurse and at different copayment fee levels
Discussion

It is clear that practice nurses can, and in some practices in NZ do, provide a broad set of primary care services, including undifferentiated general consultations. Robust data from practices E & F show that nurses there are providing in the order of 40–50% of the total clinical consultations. We have no information from this study on the relative quality of nurse versus GP consultations, but the most recent Cochrane review on this subject indicates equivalent or superior outcomes for nurse consults in primary care settings.12

The financial impact of clinical task substitution is complex and will vary by practice. For some practices, increasing the proportion of nurse consults and reducing GP consults, without changing other parameters, would result in significantly improved profitability. For others, the opposite applies.

One of the variables most amenable to practice control is the ratio between nurse consult revenue and GP consult revenue. That is, practices can increase their co-payment fees for nurse consults (and/or reduce their fees for GP consults), in order to improve the cost-effectiveness of task substitution. In most non-very low cost access practices, nurse fees need to be at 50% or more of GP fees for substitution to be cost-effective.

Another variable that might impact in a different financial context, but that will seldom be an issue in NZ (because budget holding is uncommon), is the average cost of referred services/hospital services following a practice nurse consultation versus a GP consultation.

Modelling indicates that task substitution will almost always be financially advantageous in very low cost access practices.

This study suffered from a number of limitations, including:

- Consultation diaries did not differentiate older adults—who might be expected to have different consult duration profiles.
- Limited sample—replication with a larger group of practices would improve the ability to generalise findings.
- Further activity differentiation—the current model bundles minor surgery, maternity, occupational health, and other activities into a residual ‘other’ category—ability to differentiate these based on duration, fee, etc would improve modelling accuracy.
- Assumed skill homogeneity—the model ignores differences in individual clinical competencies—in practice, task substitution is more likely to be feasible where nurses are more experienced and have enhanced training.
Funding policy implications—Service funding arrangements that involve the same remuneration for the same task regardless of who provides the service are most likely to result in increased use of nurse time. This effect can be seen in:

- Immunisations, which are paid at a constant rate regardless of provider, and which are mainly provided by practice nurses.
- Careplus/chronic condition management episodes of care, which (depending on the PHO) are often paid at a fixed price per visit and are often provided by practice nurses.
- Telephone calls/recalls/lab results calls, which are usually not specifically remunerated on a fee-for-service basis, and which are often provided by practice nurses.
- Acute/on-the-day face-to-face consults in very low cost access practices, where the average per episode fee is low, are likely to be provided primarily by practice nurses with support from GPs as required.

Therefore policies to increase utilisation of nurses in a for-profit environment could include a same-fee-regardless-of-provider policy. The same effect could be achieved by a no fee (capitation only) policy. Policies that increase task substitution will free up general practitioners to enrol more patients, and may be one way of addressing ‘closed books’ as a barrier to accessing primary care.

Implications for practice owners—Practice owners will face many constraints, including availability and skills of the local workforce, and the difficulty in changing long established business processes. Nonetheless, the opportunity exists for practices to consider new ways of providing clinical services by making best use of practice nursing skills. In many cases, an appropriate co-payment regime will make transfer of a wide range of clinical tasks from GPs to nurses cost-effective.

Practices may need to work with patients to make such a shift acceptable—to reduce the expectation that patients may have that they will always see the doctor, and to reduce the expectation of a large fee differential between a nurse and a GP visit.13 Clearly some NZ practices have already achieved this shift in expectations.

Conclusion

The pressure of population ageing, combined with the constrained fiscal environment, and finite supply of GPs, makes moving to models of care that provide better use of our medical workforce (such as through clinical task substitution) an attractive proposition for funders and patients. Our findings suggest that supporting nurses to expand their role can also, with careful attention to the relevant variables, be financially beneficial for practice owners.

Competing interests: None.

Author information: Martin Hefford, Director, Sapere Research Group, Wellington; Tom Love, Principal, Sapere Research Group, Wellington; Jacqueline Cumming, Director, Health Services Research Centre, School of Government, Victoria University of Wellington; Mary Finlayson, Associate Professor, School of Nursing,
University of Auckland; Antony Raymont, Senior Research Fellow, Health Services Research Centre, School of Government, Victoria University of Wellington

Acknowledgements: This study was funded by the Ministry of Health. We also acknowledge and thank the GPs and nurses who agreed to keep daily diaries and hence made the study possible.

Correspondence: Martin Hefford, Sapere Research Group, PO Box 587, Wellington 6140, New Zealand. Fax +64 (0)4 9157596; email: mhefford@srghealth.com

References:

Laboratory diagnosis of factitious disorder: a systematic review of tools useful in the diagnosis of Munchausen’s syndrome

Christopher A Kenedi, Kristen G Shirey, Mary Hoffa, Joseph Zanga, Jonathan C Lee, Jeremy D Harrison, Xavier A Preud’homme

Abstract

Aims To assist clinicians in the diagnosis of factitious disorder.

Methods This is a systematic review of the role of laboratory, radiologic, procedural, and pathological modalities to assist in the diagnosis of factitious disorder (Munchausen’s syndrome). The review evaluated 3104 article titles and abstracts that were identified from MEDLINE as of January 2010.

Results We found 190 articles that demonstrated techniques that will assist clinicians in recognizing fabricated manifestations of disease. The results are divided into 13 areas of clinical medicine for easy reference. They are further sub-divided by the diseases or conditions that patients have been reported to simulate and the diagnostic techniques suggested by the literature in each case.

Conclusions Factitious disorder is difficult to diagnose and may present as a wide array of fabricated conditions, but there are a range of laboratory and technical means available to assist clinicians in the 21st Century.

Patients with factitious disorder seek to be cared for despite the lack of an underlying illness. To obtain “the sick role” they fake symptoms, fabricate history and manipulate their bodies and medical investigations to simulate a condition that will require medical or surgical care. Unlike patients who are seeking a reward—e.g. workman’s compensation, or narcotics, their goal is solely to receive emotional support and medical attention.

Despite the passage of 60 years since Asher first described factitious behaviour and labelled it Munchausen’s syndrome, the accurate diagnosis of factitious disorder is still as challenging for clinicians today as it was in 1951.1 As a psychiatric condition that is usually seen by non-psychiatrists, it is under-recognized and under-appreciated in terms of its contribution to unnecessary morbidity and mortality as well as the cost to healthcare systems.

Factitious disorder is usually first suspected when inexplicable laboratory results are noted in the course of a prolonged clinical investigation.2 Therefore, it is essential that clinicians be aware of the state-of-the-art techniques available to diagnose illness fabrication in the context of factitious disorder.
Surveys demonstrate that physicians across medical specialties are uncomfortable with diagnosing factitious disorder. Estimates of the incidence of factitious disorder among general hospital admissions range from 0.6% to 1.3%. Another report indicated that 3% of non-psychiatric hospital admissions over an 8-year period were by patients who had no known organic basis for their complaint. Other studies looking at specific problems such as fever of unknown origin have found a factitious basis for 3.5%–9.3% of cases. These numbers presumably represent a fraction of the cases that actually occur, since they do not include those who are not suspected or never detected.

Factitious disorder not only impacts the doctor-patient relationship, it also results in a financial burden on the healthcare system. From case reports, we know patients with factitious disorder often undergo lengthy hospital stays and numerous tests and procedures before their activities are recognised. With advances in technology, there is both an increase in our diagnostic armamentarium as well as a greater expectation that we will obtain a diagnosis in a rapid fashion.

Because factitious presentations will not make sense in a traditional medical context—wounds that do not heal, diarrhoea without an apparent cause, blood sugars that continue to be low despite treatment—most clinicians will assume that they are missing the diagnosis and pursue increasingly obscure (and often expensive or invasive) workups.

**Methods**

**Definitions**

Eligibility criteria for inclusion in the systematic review: Studies of patients who fabricated illness, where their fabrication was detected by the use of laboratory or technical means.

**Technical means**—This included any laboratory or procedural test that could be ordered from a hospital laboratory or a reference laboratory, or a reproducible test that involved technology or equipment that should be available at an academic medical centre through medical, neurological, surgical or pathology specialty and subspecialty services in the first world.

**Factitious disorder**—For the purposes of this review, a patient with factitious disorder is defined as a person who intentionally feigns or manufactures symptoms or signs of disease for the purposes of obtaining medical care and without other external motives for their behaviour.

---

**Figure 1. Diagnostic criteria**

<table>
<thead>
<tr>
<th>DSM-IV Diagnostic criteria for factitious disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Intentional production or feigning of physical or psychological signs or symptoms.</td>
</tr>
<tr>
<td>B. The motivation for the behaviour is to assume the sick role.</td>
</tr>
<tr>
<td>C. External incentives for the behaviour (such as economic gain, avoiding legal responsibility, or improving physical well-being, as in Malingering) are absent.</td>
</tr>
</tbody>
</table>
We intentionally exclude other conditions such as malingering, conversion disorder, hypochondriasis, noncompliance, suicidal acts, admitted self-harm behaviours, iatrogenic misadventures, and errors by laboratories or mistakes of interpretation by clinicians.

The authors performed a systemic review of the literature to evaluate laboratory and technical methods that can assist diagnosticians in recognizing factitious disorder. We evaluated a possible 3104 citations to develop a state of the art guide for clinicians to use in diagnosing factitious disorder.

The focus of our review was solely on the use of laboratory and technical methods (including the use of radiology, endoscopy, neurodiagnostic tools, and histology, among other modalities) to recognize when patients may have manipulated their clinical presentation to assume the sick role.

**Primary search string**—((Factitious – (as MeSH term and Keyword)) OR (Munchhausen) OR (Munchausen—(as MeSH term and Keyword)) OR (fantastica) OR (dermatitis artefacta)). The search was current through January 2010.

Note that adding the MeSH term or keyword of “somatoform” increases the yield to 9763 articles but did not appear to offer any advantage when this search was further developed or subcategories were added. “Psychogenic” was an exception to search terms as it did bring additional cases and reports to light, but only in the field of neurology where it is applied to non-epileptic seizures and to movement disorders without an identified organic basis.

Additional searches were performed using variants of: autodestructive, somatic, somatisation, hypochondriac, faking, fabricated, faked, fictitious, artefacta, pseudologia, Asher, Ganser’s, “by proxy.” However none of these search strings as keywords (or MESH terms) resulted in additional relevant articles. Three articles were found in the cited bibliographies of papers on factitious disorder that were not found in literature searches.

**Databases reviewed**—This search string in Medline (PubMed) resulted in 3104 articles. 1088 involved primary reports of factitious manifestations of specific disorders. 190 of these articles offered unique and applicable information. An additional search in PsyINFO did not offer any articles that addressed novel issues of clinical diagnostic methodology. We also consulted with multiple specialists from each medical and surgical specialty – at several major medical centres in the United States and New Zealand - for additional examples of useful tests not covered in the literature, but none were suggested.

The European literature database EMBASE was also reviewed but not systematically. No additional articles were found using checks of above terminology. Articles without English abstracts were not investigated if their title did not appear to be directly relevant.

A conscious decision was made not to survey the forensic pathology or biochemistry literature for discussions of techniques not previously applied to factitious disorder. This was done to limit the review to articles of significance to practicing clinicians, most of whom will not have access to specialized laboratories services.
In general, the tests discussed should be available at an academic medical centre, reference laboratory or through normal consultation with medical and surgical specialists and clinical pathologists.

### Results

The table below represents the information gained from the 190 articles that offered methods for the diagnosis of factitious disorder.

#### Table 1. Tools for diagnosing factitious disorder by speciality and condition

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>LABORATORY TEST</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angina</td>
<td>Definitive test: coronary angiography. Also consider: stress test, ECG, Echocardiogram for wall motion abnormalities.⁽¹⁴⁾</td>
<td>History of prior myocardial infarction or cardiac bypass does NOT exclude factitious presentation-- may represent the patient fabricating prior symptoms.</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>Consider indirect dysrhythmia though manipulated electrolytes (Mg, K).⁽¹⁵⁾ Supervise telemetry lead placement to avoid manipulation.⁽⁶⁾,⁽¹⁷⁾ Digitalis, beta-blockers and calcium channel blockers can be measured in serum.⁽¹⁶⁾</td>
<td>Arrhythmias have also been reported in patients with surreptitious laxative or thyroxine abuse (see below).</td>
</tr>
<tr>
<td>Aortic dissection</td>
<td>In patients reportedly unable to receive CT aortogram with contrast or MRI, consider transthoracic echocardiogram.⁽¹⁹⁾,⁽²⁰⁾</td>
<td>Patient’s goal may be thoracotomy. Patients have reported an allergy to radiography contrast prohibiting CT imaging. Also allergy to gadolinium or shrapnel residue in their body prohibiting MRI.</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Serum assays for beta-blockers and calcium channel blockers. Electrochemiluminescence assays detect atenolol and metoprolol in urine samples.⁽²¹⁾,⁽²²⁾</td>
<td>Capillary electrophoresis with electrochemiluminescence detection – assays developed to detect doping in sports.</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Serum or urine assay for pseudoephedrine.⁽²³⁾,⁽²⁴⁾ Pheochromocytoma can also be simulated.⁽²⁵⁾,⁽²⁶⁾ Valsalva manoeuvre may be used by the patient during BP measurement to produce transient HTN.</td>
<td></td>
</tr>
<tr>
<td><strong>Dermatologic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelitis granulomatosa</td>
<td>Liver and lymph node biopsies may show histiocytes that contain Polyvinylpyrrolidone (PVP) suggesting self-inoculation.</td>
<td>PVP, a polymer, is used in hair sprays, skin care products, fruit juices,</td>
</tr>
<tr>
<td>Dermatitis artefacta, chelitis, Subcutaneous emphysema</td>
<td>Punch biopsy with histopathology– may reveal evidence of mechanical trauma with areas of necrosis and extravasation of RBC's.⁽²⁷⁾ Imaging or skin exam can note needle tracks for subcutaneous air.⁽²⁸⁾</td>
<td></td>
</tr>
<tr>
<td>Erythematous lesion, pemphigus</td>
<td>Apply alcohol to lesion.⁽²⁹⁾,⁽³⁰⁾ Direct immunofluorescence.⁽²⁹⁾</td>
<td></td>
</tr>
<tr>
<td>Herpes Zoster</td>
<td>Negative viral PCR.⁽³¹⁾</td>
<td></td>
</tr>
</tbody>
</table>
### Endocrine

<table>
<thead>
<tr>
<th>Condition</th>
<th>Test(s)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cushing’s syndrome</td>
<td>High-pressure liquid chromatography (HPLC) used to distinguish exogenous vs. endogenous glucocorticoids. Cortisol and corticosterone are co-secreted, so both should be checked since corticosterone will not be elevated if cortisol is surreptitiously added to urine samples.</td>
<td>Surreptitious addition of hydrocortisone requires measurement of upstream metabolites to check for evidence of suppressed pituitary secretion of ACTH.</td>
</tr>
<tr>
<td>Hyperaldosteronism</td>
<td>Glycyrrhizic acid can be detected in serum.</td>
<td>The ingestion of black liquorice has gained particular notoriety on the internet. The sweeter used to make licorice, glycyrrhizic acid can lead to treatment-resistant hypokalemia, metabolic alkalosis and hypernatremia.</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>TSH, T3, free T4, thyroglobulin, and thyroid autoantibody. Some recommend 24h radiiodine uptake testing. During thyroid storm factitious hyperthyroidism is the only aetiology in which TSH will be low.</td>
<td>Some herbal medications contain thyroid hormones. Serum thyroglobulin may less useful as 10-20% of people have anti-thyroglobulin antibodies that may affect thyroglobulin measurement.</td>
</tr>
<tr>
<td>Hypoglycaemia</td>
<td>Serum insulin, C-peptide, and proinsulin levels, assays for metformin, meglitinides, sulfonylureas. Novel incretin analogue exenatide and amylin analogue pramlintide not routinely included in hypoglycaemic drug screens. Also consider manipulation of testing strips.</td>
<td>Urine can be more sensitive than serum and may remain positive for a longer period. Anti-insulin antibodies no longer useful as more human recombinant insulin is used. Also C-peptide is cleared renally and will be elevated in renal failure.</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td>Serum chromogranin A useful to identify true pheochromocytoma. 44 Meta-iodobenzylguanidine (nuclear scan is probably the gold standard). Vanillylmandelic acid (VMA) should not be used for suspected factitious pheochromocytoma because vanilla extract or foods high in vanillin can elevate VMA.</td>
<td>Agents to mimic pheochromocytoma symptoms include self-administration of epinephrine, metaraminol, and isoproterenol. Patients can use the Valsalva manoeuvre to produce a symptom pattern suggestive of pheochromocytoma.</td>
</tr>
</tbody>
</table>

### Gastrointestinal

<table>
<thead>
<tr>
<th>Condition</th>
<th>Test(s)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>Surreptitious addition of water to stools detected by measuring faecal fluid osmolality – if less than 290 mosm/kg, water or hypotonic solution may have been added to stool. Consider 3-day stool collection for 200g/day volume check. Urine screen for phenolphthaleins, anthraquinones, and bisacodyl plus stool screen for magnesium and phosphate.</td>
<td>Urine and stool “laxative abuse” screens often need to be performed multiple times due to intermittent laxative use by patients and low sensitivity of the tests.</td>
</tr>
<tr>
<td>Gastrointestinal (GI) bleeding</td>
<td>Factitious bleeding suggested when nasogastric tube shows blood but no cause found on oesophagogastroduodenoscope. Colonoscopy is less sensitive to elucidate lower GI bleeding. The “single-stripe” sign on colonoscopy may indicate non-steroidal anti-inflammatory abuse, which can be detected on high performance liquid chromatography (HPLC).</td>
<td>Ingestion of salicylates can also cause factitious lower GI bleeds. Radiolabelling only useful in a patient injecting themselves with blood they had obtained from transfusions in-hospital; discovered when rectal blood was found not to be radiolabelled after a radio-isotope injection.</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>When produced by ipecac consumption, measure serum or urine emetine levels (detectable by HPLC). Elevated creatine kinase, leukocytosis, and transaminitis also associated with ipecac toxicity. After vomiting episodes, clinicians should see low serum potassium, low chloride after acute vomiting or prolonged episodes of vomiting.</td>
<td></td>
</tr>
<tr>
<td>Pseudo-obstruction</td>
<td>Detect loperamide or another motility slowing agent by HPLC of blood or stool.</td>
<td></td>
</tr>
<tr>
<td><strong>Gynaecology and Obstetrics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>False Ectopic Pregnancy</td>
<td>Self-injection of human chorionic gonadotropin (hCG) has been reported. This led to a negative urine beta-hCG and negative ultrasound. Also subsequent serum beta-hCG levels were widely varying.</td>
<td></td>
</tr>
<tr>
<td>Vaginal Discharge</td>
<td>Typically the fluids have an inconsistent pH or the vaginal wall shows evidence of trauma/abrasion in patients denying intercourse or instrumentation.</td>
<td></td>
</tr>
<tr>
<td><strong>Hematologic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia/Bleeding</td>
<td>Examination may show evidence of venipuncture or instrumentation, particularly of orifices or the genital-urinary tract or gastrointestinal tract on endoscopy. The most common hematologic factitious disorder is surreptitious anticoagulation abuse.</td>
<td></td>
</tr>
<tr>
<td>Anticoagulation</td>
<td>For patients not known to be on warfarin, administer vitamin K, and then re-check PT/INR. Warfarin can be assayed directly but warfarin derivatives such as the rodenticide brodifacoum require use of HPLC. For patients on warfarin, there can be “false-resistance” to warfarin that requires extensive clinical input and attention. This must be cautiously approached as genetics can play a large role. If vitamin K and plasma Warfarin levels are irregular, consider genetic testing if there is no indication of factitious behaviour. Prolonged PTT but normal reptilase time suggest presence of heparin. Another test is to add protamine sulphate or an ion-exchange resin to the blood sample which will indicate the presence of exogenous heparin.</td>
<td></td>
</tr>
<tr>
<td>Aplastic Anaemia</td>
<td>This has been provoked by the ingestion of alkylating agents such as busulfan or other chemotherapy agents.</td>
<td></td>
</tr>
<tr>
<td>Sickle Cell Disease</td>
<td>Confirmation with haemoglobin electrophoresis. Important for patients not known to local clinicians.</td>
<td></td>
</tr>
<tr>
<td>Thrombocytopenia/ITP (also see Rheumatologic-Purpura)</td>
<td>Purpura and ITP Feigned by quinidine ingestion—check serum quinidine level. Isolated thrombocytopenia has been caused by quinine ingestion.</td>
<td></td>
</tr>
</tbody>
</table>
### Infectious diseases

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Case reports notes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteraemia</td>
<td>Polymicrobial bacteraemia or unusual organisms in blood cultures should raise suspicion.</td>
<td>Stool flora, pet flora as most common exogenous material.</td>
</tr>
<tr>
<td>Fever</td>
<td>Directly observed temperature measurement using electronic thermometer.</td>
<td>No recent ingestion of hot beverages, warm wax or wet cotton in ears. In 1979, 9% of patients presenting to an NIH study on fever of unknown origin were found to be suffering from factitious disorder.</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>Repeat HIV ELISA and Western blot, check viral load for acute HIV.</td>
<td>Normal CD4 count and undetectable viral load can claim suppression with anti-retrovirals. But antibody should still be positive.</td>
</tr>
<tr>
<td>Wounds</td>
<td>Apply fluorescein or tetracycline to wound, then examine hands/nails for fluorescence.</td>
<td>Non-healing wounds will heal when casted-but this can be circumvented by patients. Substances introduced into wounds include: human/animal faeces, household toxins, aquarium water, foreign bodies, milk and others.</td>
</tr>
</tbody>
</table>

### Neurologic

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement disorders</td>
<td>EMG and EEG reveal inconsistent amplitude patterns in factitious tremors and myoclonus.</td>
<td>Dopaminergic drugs including antipsychotics may be taken to induce Parkinsonian symptoms.</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>MRI brain demonstrating at least 2 different regions of white matter change CSF with mild lymphocytosis, oligoclonal bands in IgG region.</td>
<td>CSF protein electrophoresis is 90% sensitive in pts with active MS symptoms.</td>
</tr>
<tr>
<td>Non-epileptiform seizures</td>
<td>Serum prolactin level at baseline (near onset of epileptiform activity) then 20 minutes later. However this can be normal in partial-seizures and elevated in epilepsy. Video EEG useful but this can miss frontal lobe seizures which have movements that can suggest factitious behaviour such as pelvic thrusting and cycling movements.</td>
<td>One estimate suggests that 15-30% of the patients presenting to epilepsy clinics with refractory epilepsy are psychogenic in nature. Most of these patients are unlikely to have factitious disorder.</td>
</tr>
</tbody>
</table>

### Nephrologic/Urologic

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diuretic Abuse/Bartter syndrome</td>
<td>Urine assays can detect furosemide, torsemide, and hydrochlorothiazide. HPLC can detect Furosemide and other diuretics.</td>
<td>Bartter syndrome is a rare inherited defect in the ascending loop of Henle, there are at least 6 reports of factitious presentations of this condition.</td>
</tr>
<tr>
<td>Goodpastures Syndrome</td>
<td>See haematuria and haemoptysis sections.</td>
<td>One patient appeared in 3 different peer reviewed articles.</td>
</tr>
<tr>
<td>Haematuria</td>
<td>Direct observation of urine collection to ensure blood or iodine not added to sample. Three tube test to rule out urethral trauma—first tube should have most RBCs if self-inflicted urethral trauma is the source of blood. Haematuria can be simulated by introducing foreign bodies such as paper clips or safety pins. This can be detected on X-ray or with direct cystoscopy. Air in the bladder on imaging is also indicative of self-manipulation.</td>
<td>Reports suggests that 0.6-3% of patients presenting with Haematuria have tampered with urine samples to produce false positive tests.</td>
</tr>
</tbody>
</table>
| Nephrolithiasis | Microscopic exam, infrared spectrophotometry, crystallography, X-ray diffraction to characterize crystals suspected to be non-physiologic.  
3.5% of stones submitted by patients were found to be artefacts (not all were factitious). One case report of subcutaneously implanted metal in abdomen at level of ureter mimicking stone on plain film in patient who claimed IV contrast allergy. | Normal serum protein, albumin, creatinine, and BUN levels should raise suspicion in a patient with proteinuria. |
|-----------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Proteinuria     | Surreptitious protein addition to urine or bladder detectable by urine protein electrophoresis revealing abnormal alpha and beta globulin fractions. Egg albumin antibody can be used if this is suspected.  
One case report of subcutaneously implanted metal in abdomen at level of ureter mimicking stone on plain film in patient who claimed IV contrast allergy. |------------------------------------------------------------------------------------------------|
| Oncology        | Manipulation of records. Multiple case reports of patients claiming to bring records of disease and diagnosis at remote or foreign institutions requiring treatment. Contact the document’s authors/institution. If they are not available, police can be asked to assist verification. At least one report of a patient obtaining sample medical reports off of the internet.  
Multiple cases of prophylactic mastectomy for falsely claiming a strong family history of breast cancer. |------------------------------------------------------------------------------------------------|
| Ophthalmology  | Homatropine drops detected by identification of homatropine in tears.  
Successful techniques for investigating these injuries include pH testing to detect acidic and alkali chemicals and imaging and skin exam to look for evidence of traumatic puncture to introduce air or foreign body materials.  
Other ophthalmic presentations include the insertion of foreign body crystals, fungal endophthalmitis, self-induced anterior scleritis, and reports of factious conjunctivitis, primarily by inserting dental plaque as an irritant. |------------------------------------------------------------------------------------------------|
| Pulmonary       | Videoflourscopy can be useful as well as surface EMG techniques.  
Lung biopsy specimen analysed by x-ray energy-dispersive spectroscopy showed talc crystals.  
Chronic ingestion of aspirin in patients with known salicylate sensitivities.  
Clear tape has been used to fool pulse oximeters.  
A patient received 25+ admissions to more than 14 hospitals and at least 16 bronchoscopy investigations, all of which were negative. |------------------------------------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>Airway and Swallowing difficulties</th>
<th>Videoflourscopy can be useful as well as surface EMG techniques.</th>
</tr>
</thead>
</table>
| Asthma                             | Lung biopsy specimen analysed by x-ray energy-dispersive spectroscopy showed talc crystals.  
Chronic ingestion of aspirin in patients with known salicylate sensitivities.  
Clear tape has been used to fool pulse oximeters. |
| Cystic Fibrosis                    | Sweat chloride test, but exam should show digital clubbing and abnormal X-rays.  
In one case the sweat-chloride test was manipulated and the patient discovered by evaluation of the sweat potassium.  
Fiberoptic bronchoscopies that don’t show even a minute trace of blood in the oral cavity, glottic area or tracheobronchial tree during a presentation of “active haemoptysis” should elicit a possibility of factitious haemoptysis. In that case examine the nares, palate and posterior tongue for evidence of self-induced trauma.  
Also consider ingestion of anti-clotting agents and cough abrasion of the lung.  
A patient received 25+ admissions to more than 14 hospitals and at least 16 bronchoscopy investigations, all of which were negative. |
| Haemoptysis                        |-----------------------------------------------------------------|
Respiratory Failure

Arterial Blood Gas measurements should demonstrate incongruities.

At least 10 reported cases of factitious patients receiving intubation for respiratory failure.\(^{1,24-126}\)

**Rheumatologic**

<table>
<thead>
<tr>
<th>Arthritis</th>
<th>Insertion of metal fragments into joint detected by diffraction radiology or microscopic analysis of synovial aspirate.(^{127})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lupus</td>
<td>Feigned usually by symptomatic history +/- borderline elevation in ANA; repeat serum ANA, anti-dsDNA, anti-Smith antibodies. Seronegative lupus can occur however. Note that in an active flare complement CH50, C3 and C4 levels should be low.(^{128,129})</td>
</tr>
<tr>
<td>Vasculitis (also see Hematologic – Thrombocytopenia, and Nephrologic-Goodpastures)</td>
<td>Tissue biopsy of lesions may reveal foreign material (saliva, talcum powder) injected to create purpuric lesions.(^{130})</td>
</tr>
</tbody>
</table>

**Discussion**

This review attempts to comprehensively examine the limited information available on adjunctive methods to diagnose or suggest the diagnosis of factitious disorder. To make it more useful to the practicing clinician, we have attempted to list the methods available for each specialty by diagnostic category. When multiple authors described similar diagnostic techniques, we selected a representative reference from the group.

Potential limitations include search string errors, reviewer biases, and the lack of the systematic inclusion of the EMBASE database (although we felt the additional journals of that database were more oriented to biomedical rather than clinical literature). We also may have missed discussions in non-English literature as we only had articles translated if their titles or abstracts were available in English and appeared to be relevant.

Although this study was performed as a systematic review of the literature, we were unable to comment on the quality or characteristics of the tests used in most circumstances. The large majority of the reports were from case reports and did not provide sufficient data for critical analysis of test characteristics. Many of these tests have distinct limitations that are discussed in the pathology and toxicology literature.

In the age of enormous volumes of medical information on the Internet, there are specific sites for how to fake illnesses, as well as easy accessibility to terminology and copies of documents such as sample pathology reports.\(^{9-12}\) Patients no longer need medical training or experience to engage in high-level factitious behaviour.\(^{10}\) While there may be some concern that we are providing a “how-to” guide for illness fabrication, we feel that it is more important for clinicians to have an easily accessible source of information for detecting factitious illness.

All the information in this article has been presented before in the medical literature and is available in piecemeal form. As patients with factitious disorder are generally found to have at least a high school education or higher, clinicians need to be prepared
to maintain a balanced index of suspicion when the history, clinical exam, and laboratory data do not make sense.\textsuperscript{13}

**Conclusion**

Factitious Disorder will always be a challenging diagnosis for clinicians. In the modern hospital environment where the length of stay is short, it can easily be missed. This can result in multiple admissions for patients where batteries of increasingly obscure tests are undertaken to diagnose patients with inexplicable symptoms. This review is an attempt to provide a comprehensive reference of useful laboratory techniques for clinicians who suspect that a patient’s illness may be due to factitious behaviour.

It still requires the clinician to maintain an index of suspicion and to include factitious disorder in the differential diagnosis. Every test can present with false positives or false negatives due to test limitations or laboratory error; this guide is not an end in the diagnosis of factitious disorder, but a beginning for clinicians who have developed a clinical concern that a patient may be fabricating illness. Repeat and or confirmatory testing should be encouraged as well as Liaison Psychiatry input and perhaps most importantly, collateral information from other caregivers. While laboratory testing may be invaluable for the diagnosis of factitious disorder in some cases, it needs to be interpreted within the context of the patient’s complete history and physical findings.

**Competing interests:** None.

**Author information:** Christopher A Kenedi, Consultant, Departments of General Medicine and Liaison Psychiatry, Auckland City Hospital, Auckland, New Zealand—and Adj Associate of Internal Medicine and Psychiatry, Duke University Medical Center, Durham, NC, USA—and Hon Sr Lecturer. Auckland University School of Medicine, Auckland, New Zealand; Mary Hoffa, Jeremy D Harrison, Residents, Departments of Medicine and Psychiatry, Duke University Medical Center, Durham, NC, USA; Kristen G. Shirey, Joseph Zanga, Clinical Associates in Medicine and Psychiatry, Duke University Medical Center, Durham, NC, USA; Xavier A Preud’homme, Assistant Professors of Internal Medicine and Psychiatry, Duke University Medical Center, Durham, NC, USA; Jonathan C Lee, Associate Medical Director, Farley Center at Williamsburg Place, Williamsburg, VA, USA

**Acknowledgements:** We thank Harold Goforth MD and Jacques Wallach MD for their assistance.

**Correspondence:** Christopher A Kenedi, Liaison Psychiatry, Level 4 Support Building, Private Bag 92024, Auckland, 1142 New Zealand. Fax: +64 (0)9 3078945; email: Bluedevilkiwi-factitious@yahoo.com

**References:**


Imaging of the thyroid gland

Amirala Khalessi, Kim-Chi Phan-Thien

Abstract

Incidental and symptomatic pathology of the thyroid gland is common in the community. Although technological advances have led to the development and improvement of imaging modalities, ultrasound remains the primary diagnostic tool. In this article, the authors examine the role of imaging and its recent advances in the management of thyroid cancer.

Imaging of the head and neck, and in particular the thyroid gland, has improved over recent years. There have been developments enhancing traditional methods of imaging, as well as improved understanding and interpretation of radiological signs. Furthermore, there have been new technologies, which are yet to establish their role in the diagnostic process. Here, we focus on the role of imaging and its recent advances in the management of thyroid cancer.

The thyroid nodule

The thyroid nodule is a common clinical entity. Palpable nodules are present in approximately 4 to 7% of adults, and up to 50% of adults will have non-palpable nodules discovered at the time of death.1 With the increasing use of radiology in modern medicine, incidental nodules are reported in up to 27% of the population.2 Only 1 in 20 palpable thyroid nodules is malignant.2 Non-palpable nodules have the same risk of malignancy as palpable nodules of the same size.3 Lack of symptomatology does not exclude malignancy, as 75% of patients with thyroid cancer are asymptomatic.4

The incidence of thyroid cancer has almost tripled in the United States in the last 35 years, from 4.85 cases per 100,000 in 1975 to 12.23 cases per 100,000 in 2007.5 Despite this, it accounts for only 1.5% of all newly diagnosed cancers.6 Given this combination of a relatively rare malignant disease on the background of a relatively common benign condition, the ability to detect the presence of malignancy is an important challenge in the management of thyroid nodules. Differentiating the malignant from the benign nodule has appeared on the agenda in multiple forums, with decision algorithms involving clinical factors, radiological findings and cytology.

The thyroid nodule has been traditionally evaluated with clinical examination, ultrasound and fine needle aspiration cytology (FNAC). Adjuncts to ultrasound include computed tomography (CT), magnetic resonance imaging (MRI) and more recently, fluorodeoxyglucose positron emission tomography (FDG-PET), ultrasound-based elastography and magnetic resonance spectroscopy (MRS).

Cytological examination of material obtained by fine needle aspiration is the best single test for differentiating malignant from benign thyroid lesions.7 Compared with
FNAC, ultrasound has the advantage of being a noninvasive procedure and giving immediate information. However, ultrasound is operator dependent. It is used to assess the size and appearance of nodules and is helpful in facilitating FNAC. If the nodule contains a significant cystic component or is located posteriorly, there is a decreased accuracy of FNAC performed with palpation. After an initial non-diagnostic cytology result, repeating the FNAC with ultrasound guidance will yield a diagnostic cytology specimen in 75% of solid nodules and 50% of cystic nodules.

Nodules greater than 10 mm in size in at least two dimensions on ultrasound are deemed clinically significant and should undergo FNAC. Smaller nodules should undergo further evaluation if they are deemed high-risk. High-risk features include aspects of history such as prior head and neck irradiation, the presence of a cancer syndrome, and family history, as well as specific ultrasound findings.

Sonographic features suggestive of well-differentiated thyroid cancer include size, irregular infiltrative margins, nodular composition, the absence of a halo, hypoechogenicity of the nodule and intranodular hypervascularity. Despite the development of high-resolution ultrasound, and abundant studies examining the characteristics of thyroid cancer on modern machines, the literature fails to identify a single sonographic feature, or combination of features, which is adequately sensitive or specific to identify all malignant nodules. Previously, malignancy could be predicted with a high level of specificity in only a few patients with ultrasound alone.

Recent studies with high-resolution ultrasound report a sensitivity and specificity in the order of 80%, and have a positive predictive value of only 40%. Some features useful in the accurate identification of thyroid cancer subtypes have been identified in the literature. Microcalcifications, resulting from superimposed psammoma bodies, have a specificity as high as 95% for the presence of papillary thyroid carcinoma. Papillary thyroid carcinoma has been identified in 87% of solid nodules. A spongiform appearance is 99.7% specific for benign thyroid nodules. Despite a growing body of research on sonography, management algorithms for the thyroid nodule continue to rely on the role of FNAC. The primary contribution of ultrasound lies in the determination of nodule size and guidance for FNAC.

Radiological adjuncts in the assessment of the thyroid nodule are used on a case-by-case basis. Although MRI has a more established role in the assessment of locally advanced disease, it has been used in the diagnostic process of thyroid nodules. Most malignant thyroid tumours demonstrate isointense signal to normal thyroid tissue on T1 weighted images and hyperintense signal on T2 weighted images, though malignancy is often indistinguishable from benign thyroid nodules.

FDG-PET scanning has been used to help distinguish benign from malignant nodules based on the increased glucose metabolism of malignant cells. 1-2% of people undergoing FDG-PET imaging for other reasons have incidental thyroid nodules, and the risk of malignancy in these nodules can be as high as 33%. PET scans appear to have relatively high sensitivity for malignancy but low specificity, though results vary among studies. There may be little advantage to routine PET-CT over modern high-resolution ultrasound scanners.
Another imaging technology, MRS, allows biochemical characterisation of scanned tissue, and has been investigated as a feasible means of identifying malignant nodules. Thyroid nodule proton spectroscopy ex vivo has been able to distinguish purely benign follicular neoplasms from follicular tumours that have an atypical follicular pattern on cytology. A study correlated choline peaks with the presence of malignancy with a sensitivity of 100% and specificity of 89%.

Elastography is an emerging new technique that uses ultrasound to provide an estimation of tissue stiffness by measuring the degree of distortion under the application of an external force. Ultrasound elastography has been estimated to predict malignancy with up to 96% specificity and 85% sensitivity. Although promising developments, these radiological adjuncts to ultrasound are not routinely used in the characterisation of thyroid nodules.

Imaging of thyroid cancer—pre- and post-treatment

Once diagnosed, the staging of thyroid cancer is determined by lymph node involvement, the presence of metastatic disease, the anatomical extent of the tumour, and, unlike other malignancies, the patient’s age and tumour histology.

Ultrasound is the primary imaging modality for T staging. For T3 and T4 tumours, CT and MRI provide additional information. They have a role in the assessment of large, rapidly growing or retrosternal tumours, and cancers complicated by vocal cord paralysis, fixation to adjacent tissues and symptoms suggestive of compression or invasion of surrounding structures.

Compared with ultrasound, tumour invasion into posterior paratracheal tissues and the substernal area is better visualised on MRI, though CT is more sensitive for the detection of calcifications. MRI and CT are also helpful in the anatomical localisation of an abnormal focus on radioiodide or FDG-PET scan.

The American Thyroid Association recommends the use of preoperative neck ultrasound for assessing the contralateral thyroid and cervical lymph nodes in patients with malignant cytological findings. Although ultrasound is operator dependent, it has a higher sensitivity for the detection of cervical lymph node metastases than CT, MRI or PET. Preoperative ultrasound identifies suspicious cervical lymphadenopathy in 20-31% of cases, potentially altering the surgical approach in as many as 20% of patients.

Sonographic features suggestive of abnormal metastatic lymph nodes include loss of the fatty hilum, short axis, hypoechogenicity, cystic change, calcifications, and peripheral vascularity. Lymph nodes greater than 9 mm in diameter, those with a longitudinal-transverse ratio less than 2.0, and those with a round configuration rather than oval shape are more likely to contain metastatic disease. Malignant lymph nodes are more likely to occur in levels III, IV and VI.

Preoperative ultrasound identifies only half of the lymph nodes found at surgery, due to anatomical structures obscuring the sonographic view. In this context, CT and MRI have a role in the evaluation of metastatic nodal disease. However, intravenous contrast used for a CT scan may compromise the use of postoperative radioactive iodine and non-contrast studies may prove difficult to interpret. Unlike iodine contrast, MRI with gadolinium does not affect thyroidal iodine uptake.
After total thyroidectomy and radioactive iodine (RAI) remnant ablation, surveillance cervical ultrasound is performed to evaluate the thyroid bed and cervical nodal compartments. Serum thyroglobulin should be undetectable and is followed as a reliable indicator for persistent or recurrent disease. When thyroglobulin levels rise, the patient may be assessed with ultrasound, CT, RAI whole body scan, and FDG-PET for the presence of recurrent local or metastatic disease. Any suspicious lymph nodes or thyroid bed nodules are biopsied.

Cervical ultrasonography is highly sensitive in the detection of local recurrence and cervical lymph node metastases in patients with well-differentiated thyroid cancer, even when TSH-stimulated serum thyroglobulin levels remain undetectable. Cervical ultrasonography combined with recombinant human TSH has been shown to have a sensitivity of 96% and a negative predictive value of 99% in the detection of active disease. However, CT and MRI are better for the evaluation of retropharyngeal, parapharyngeal and retrotracheal nodes, which are obscured by airway or bony structures on ultrasound.

Diagnostic RAI whole body scans are useful when there is little or no remaining thyroid tissue. Disease not visualised on the RAI whole body scan, regardless of the activity of 131I employed, may occasionally be visualised on the treatment whole body scan images after larger therapeutic doses of 131I.

FDG-PET is used to localise disease in thyroglobulin-positive, RAI scan-negative patients. In poorly differentiated cancers, which are unlikely to concentrate RAI, FDG-PET helps to identify sites of disease that may be missed with conventional RAI scanning. FDG-PET also has a role in the staging and surveillance of invasive or metastatic Hurthle cell carcinoma. It is also used to monitor the clinical response of recurrent disease following surgical resection, embolisation, external beam irradiation or systemic therapy.

**Summary**

Radiology and nuclear medicine play an important role in the management of the thyroid nodule and thyroid cancer. However, decision-making algorithms on the clinical management of thyroid nodules continue to hinge on the findings of FNAC. The traditional modality of ultrasound, now with enhanced high-resolution, is important in facilitating FNAC, as well as the staging and surveillance of thyroid cancer.

With the increasing detection of thyroid nodules as incidental findings on imaging, there has been attention on alternate imaging in the attempt to distinguish benign from malignant disease, and to reduce the rate of invasive interventions such as diagnostic hemithyroidectomy. These remain largely experimental, confined to the realm of research, and are not easily accessible.

In the investigation of recurrent thyroid cancer, imaging methods such as CT and MRI may have a role. The modalities of MRS, RAI scanning and FDG-PET are yet to establish their position in the clinical management of thyroid disease.
Competing interests: None.

Author information: Amirala Khalessi, Surgical Registrar, Department of Surgery, Royal Prince Alfred Hospital, Sydney, Australia; Kim-Chi Phan-Thien, Surgical Registrar, Department of Surgery, Liverpool Hospital, Sydney, Australia

Correspondence: Dr Amirala Khalessi, Department of Surgery, Royal Prince Alfred Hospital, Missenden Road, Camperdown, NSW 2050, Australia. Email: akhalessi@me.com

References:


Encapsulating peritoneal sclerosis—a complication of peritoneal dialysis

Caroline L Chembo, Alastair Macdonald, Nicola Hay, Philip Matheson, Grant Pidgeon, Murray Leikis

Abstract
Encapsulating peritoneal sclerosis (EPS) is a rare complication of peritoneal dialysis. It often presents with non-specific symptoms, leading to a delay in diagnosis and a poor prognosis. Here we report a case of EPS in a patient treated with peritoneal dialysis and discuss the risk factors, diagnostic challenges and treatment options available.

Case report
We present a 66-year-old Caucasian man on haemodialysis three times a week at time of presentation with gastrointestinal symptoms. He had a history of end-stage renal failure secondary to IgA nephropathy. His other comorbidities included a 35-year history of hypertension treated with various beta-blockers and previous parathyroidectomy. The beta-blockers included atenolol in the earlier years later changed to controlled-release metoprolol.

He had been on peritoneal dialysis from 1986 to 1992 before receiving a deceased donor renal transplant. 13 years later his renal function deteriorated and biopsy showed chronic allograft nephropathy. In September 2005 he returned to dialysis, opting for peritoneal dialysis as this suited his lifestyle.

In April 2009 he started experiencing non-specific symptoms such as general malaise, anorexia and fatigue. These were initially attributed to under-dialysis the symptoms coincided with declining dialysis adequacy. Switching to haemodialysis was advised but did not happen until September of that year due to patient reluctance to switch and vascular access issues. In total, the patient had 10 years of peritoneal dialysis exposure and had two episodes of bacterial peritonitis, once in 1988 and again in 2007.

In November 2009 he presented to hospital with abdominal discomfort, early satiety and feeling generally unwell. As he still had his tenckhoff catheter in situ, he had a peritoneal flush. The fluid had 800×10^6/L mononuclear cells, Gram stain was negative and there were no acid fast bacilli. He was treated with intraperitoneal antibiotics (gentamicin and vancomycin).

The initial symptoms resolved but a month later he represented with similar symptoms. Gastroscopy showed mild gastritis for which he received omeprazole. The symptoms abated slightly but 2 weeks later he represented with abdominal pain and vomiting copious amounts of fluid about 2 hours after eating. His tenckhoff was removed and a peritoneal biopsy was done.
He had a CT scan (Figure 1) which showed loculated peritoneal fluid and slightly thick walled and enhancing small bowel. Given his symptoms, CT findings and peritoneal biopsy report (Figure 2), a diagnosis of encapsulating peritoneal sclerosis was made.

The bowel obstruction was managed conservatively with nasogastric (NG) tube on free drainage and antiemetics. He was commenced on intravenous hydrocortisone and parenteral nutrition. When the vomiting had settled he switched to oral prednisone at 60 mg and tamoxifen at 20 mg daily.

**Figure 1. CT scan showing loculated peritoneal fluid and slightly thick walled and enhancing small bowel**

![Figure 1. CT scan showing loculated peritoneal fluid and slightly thick walled and enhancing small bowel](image)

White arrow=loculated effusion; black arrow=enhancing small bowel.

**Figure 2. Peritoneal biopsy slide (×400) showing dense hyalinised fibrous tissue**

![Figure 2. Peritoneal biopsy slide (×400) showing dense hyalinised fibrous tissue](image)

Arrow indicates hyalinised fibrous tissue.
The vomiting abated for about 3 weeks but recurred leading to his readmission. His management was still conservative, he was kept nil by mouth and had an NG tube on free drainage. His steroids were changed to parenteral.

The prognosis for encapsulating peritoneal sclerosis is quite poor, therefore a discussion with the patient and his family was arranged. After the family meeting and with the lack of patient improvement with conservative management, the patient decided to have all treatment withdrawn. Palliative care measures were instituted and the patient was discharged home with input from the Hospital Palliative Care Team. The patient died 2 days later at home.

**Encapsulating peritoneal sclerosis (EPS)**

EPS is a condition that is characterised by bowel loops being cocooned in thickened peritoneum. It is a rare but recognised complication of peritoneal dialysis. Since the initial symptoms are non-specific and are usually attributed to failure of peritoneal dialysis, the patient is then prepared to switch to haemodialysis or transplanted. It has been known to occur immediately post bacterial peritonitis, however diagnosis is usually established after cessation of peritoneal dialysis.

Duration on peritoneal dialysis has been associated with EPS. It is rare if peritoneal exposure is less than 2 years but rises to around 20% with exposure over 8 years. The peritoneal membrane transport status is also linked to EPS with high transport status being more commonly associated with EPS. History of recurrent episodes of peritoneal dialysis related peritonitis also increases the risk of developing EPS. EPS has been associated with conditions such as SLE, malignancy, peritoneo-venous shunts and beta-blockers, especially practolol but idiopathic cases have been described.

The pathophysiology of peritoneal sclerosis is not fully understood. When linked to peritoneal dialysis, the process of sclerosis is thought to be enhanced by advanced glycosylated end products. These products result from the glucose degradation in the PD fluid during the process of sterilisation. However other mediators are thought to play a role. Vascular endothelial growth factor (VEGF) and transforming growth factor beta (TGF-β) are possible mediators of this process. Angiotensin II levels may also have a role as levels are very elevated in PD effluent of patients with EPS. Epithelial–mesenchymal transition has also been postulated as the potential mechanism of the peritoneal fibrosis.

Clinical features are initially non specific with low grade fever, raised inflammatory markers and malnutrition. Patients may also present with recurrent cloudy PD effluent without overt peritonitis. Dialysis adequacy may also be declining. As the condition progresses bowel obstruction can develop. Mortality can be as high as 60% depending on the duration of peritoneal dialysis.

Radiological features are non-specific and may not be diagnostic including features of bowel obstruction. CT may show calcification of peritoneum, loculated pockets of fluid and air fluid levels. PET scan may have a role especially in the early inflammatory stage.
Histology reveals hyalinised fibrous connective tissue with chronic inflammatory cells and calcium deposition.\textsuperscript{10}

As this condition is very rare, the treatment reports are based mostly on single case reports or a few case series. The initial management involves switching the patient to haemodialysis if they are on peritoneal dialysis. It will also involve treating the probable cause of the EPS. Management is usually supportive and involves resting the bowel with nasogastric aspiration. During this time nutrition is usually provided via total parenteral nutrition.

Steroids, because of their anti-inflammatory properties are commonly used with some success. They can be used as monotherapy but many investigators have used combined therapies with other immunosuppressants such as cyclosporine, azathioprine and mycophenolate.\textsuperscript{1,11} A recent report of three cases has shown benefit from a combination of mycophenolate and steroids.\textsuperscript{11}

Tamoxifen, in a dose of 20 mg, because of its anti-fibrotic properties, has been used in some cases with success.\textsuperscript{12}

Surgery has previously been associated with poor outcome although some case reports of very good outcomes from surgery have been published. These cases have had meticulous adhesiolysis without enterostomy.\textsuperscript{13}

There are currently other treatments that are under investigations e.g. intraperitoneal angiotensin converting inhibitors, angiotensin receptor blockers and COX-2 inhibitors and low glucose degradation product peritoneal fluids.\textsuperscript{6}

We have presented a patient who developed encapsulating peritoneal sclerosis after having had 10 years of exposure to peritoneal dialysis fluid. During this time he had two episodes of culture proven bacterial peritonitis. He had also received beta-blockers for 32 years for treatment of his hypertension. Any of these factors may have increased his risk for developing EPS and the presence of multiple factors may have increased his risk further.

EPS, although rare, is a condition that has high mortality. More research is needed in understanding its pathophysiology and treatment options.

**Author information:** Caroline L Chembo, Advanced Trainee Nephrology, Renal Department, Palmerston North Hospital, MidCentral DHB, Palmerston North; Alastair Macdonald, Consultant Nephrologist, Renal Department Wellington Hospital, Wellington; Nicola Hay, Consultant Nephrologist, Renal Department Wellington Hospital, Wellington, Philip Matheson, Consultant Nephrologist, Renal Department Wellington Hospital, Wellington; Grant Pidgeon, Consultant Nephrologist, Renal Department Wellington Hospital, Wellington; Murray Leikis, Consultant Nephrologist, Renal Department Wellington Hospital, Wellington

**Correspondence:** Dr Caroline L Chembo, Palmerston North Hospital, MidCentral DHB, Ruahine Street, Palmerston North, New Zealand. Fax +64 (0)6 3508058; email: chemboc@doctors.net.uk

**References**


A cerebral mass in a patient with Churg Strauss syndrome

Nazish Ilyas, Christos Fountzilas

Abstract

Background Differential diagnosis of mass brain lesions with surrounding peripheral-ring enhancement includes infections, tumours, demyelinating diseases, and vascular lesions such as infarcts or haematomas.

Methods This paper is the case report of a 72-year-old Caucasian female patient who presented with a subacute onset neurologic deficit and a heterogeneous cerebral mass, an imaging finding worrisome for malignancy.

Conclusion More specific brain imaging is necessary to differentiate between different diseases, especially malignant CNS tumours and abscesses. Specific risk factor identification is important but cannot replace stereotactic aspiration of pus for accurate microbiologic diagnosis and initiation of targeted antimicrobial treatment of cerebral abscesses.

Differential diagnosis of mass brain lesions with surrounding peripheral-ring enhancement includes pyogenic brain abscesses, other infections (e.g. toxoplasmosis), malignant tumours, demyelinating diseases, and vascular lesions such as infarcts or haematomas. More specific brain imaging is necessary to differentiate between different diseases, especially malignant central nervous system (CNS) tumours and abscesses.

Specific risk factor identification such as otitis media, mastoiditis, paranasal sinusitis, dental infection, cyanotic heart disease, bacterial endocarditis, pyogenic lung disease, T-cell deficiency and trauma is important but cannot replace stereotactic aspiration of pus for accurate microbiologic diagnosis and initiation of targeted antimicrobial treatment of cerebral abscesses. It can guide empiric treatment though in patients too ill to undergo any form of intervention.

Case report

A 72-year-old Caucasian female with past medical history of Churg Strauss syndrome on steroids and methotrexate, aortic stenosis, asthma, achalasia, atrial fibrillation on anticoagulation, presented with subacute onset of left-sided weakness. She denied headache, loss of consciousness, or seizures. She did not report any fever, sinus or ear pain, vomiting. She had no recent change in her numerous chronic medical conditions.

On admission, vital signs were significant for tachycardia and physical examination revealed left facial droop and left-sided hemiparesis. The remainder of the examination was normal.

CT scan of the brain revealed a large area of low density in the right frontal lobe suggestive of a mildly heterogeneous underlying mass lesion. Further workup with
Gadolinium-enhanced magnetic resonance imaging of the brain revealed a conglomeration of ring enhancing lesion in the right frontal lobe (Figure 1) that demonstrated diffusion restriction (low signal in apparent diffusion coefficient-ADC-map and high signal in diffusion-weighted imaging (Figure 2 and 3), with an exuberant amount of surrounding oedema (high signal in FLAIR imaging) (Figure 4), findings suggestive of a brain abscess.

Right frontal craniotomy with use of frameless stereotaxy was performed to evacuate the intracranial abscesses. Culture of the pus yielded *Nocardia asteroides* and *Streptococcus viridans*.

Postoperative antibiotic treatment with trimethoprim-sulfomethoxazol and ceftriaxone was started.
Three months after initiation of treatment, there was minimal residual neurologic deficit and repeat imaging showed marked interval improvement in the size of the surgical cavity and in surrounding oedema.

**Discussion**

In the United States, it has been estimated that 500–1000 new cases of *Nocardia* infection occur annually.\(^3\) Cerebral nocardiosis is rather uncommon, representing only 2% of all cerebral abscesses.\(^4\)

Our patient presented with a subacute onset neurologic deficit and a heterogeneous cerebral mass, an imaging finding worrisome for malignancy. Differential diagnosis between cerebral abscesses and tumours is greatly improved by the adjunct of diffusion-weighted imaging (DWI) and perfusion-weighted imaging (PWI); yet there is still overlap.\(^5\) Proton MR spectroscopy is useful in discriminating abscesses from cystic tumours or even identifying the nature of the abscess—whether it has a pyogenic, tubercular, or fungal origin.\(^6\) The definitive microbiological diagnosis, though, is made by culture.\(^2\)

In our case the patient had impaired cellular immunity secondary to chronic methotrexate and corticosteroid use, an established predisposing risk factor for the development of nocardial brain abscess. Treatment of nocardial brain abscess includes a combination of antibiotics, surgical debridement and improvement of immune function. First line antibiotics are the sulfonamides, mainly TMP-SMX, and the duration of treatment is 12 months.\(^7,8\)

Second-line medical treatment is amikacin, ciprofloxacin, imipenem, minocycline, 3rd-generation cephalosporins.\(^8,9\) Some authors have recommended medical management alone in immunocompetent patients with a brain abscess less than 2 cm in diameter and an established diagnosis of *Nocardia* spp. from an extraneural source.\(^10\) The source of the infection should be treated surgically or medically to prevent recurrence of the abscess,\(^2\) though the primary focus, mostly pulmonary, cannot be always identified.\(^11\)

Mortality reaches 75–90% for immunocompromised patients, and patients with disseminated nocardiosis or with multiple brain abscesses.\(^7\) Mortality is also higher (50%) for patients undergoing needle aspiration compared to patients undergoing open craniotomy (24%).\(^9\)

**Author information:** Nazish Ilyas; Medical Resident; Christos Fountzilas; Medical Resident; Department of Medicine, Lenox Hill Hospital, New York, NY, USA

**Correspondence:** Christos Fountzilas, Department of Medicine, Lenox Hill Hospital, 100 East 77 Str, New York, NY, 10021, USA. Email: cfountzilas@lenoxhill.net

**References:**


Reversible knuckle hyperpigmentation in B12 deficiency

Vivek Kumar, Vishal Sharma

Clinical—A 25-year-old female, a university student, presented with complaints of gradually progressive blackish discoloration of skin over the dorsum of proximal interphalangeal and distal interphalangeal joints of both hands for the past 3 months (Figure 1).

Figure 1

She was a vegan and gave no history of any chronic drug intake. Her investigations revealed haemoglobin as 87 gm/L with normal leukocyte and platelet counts; peripheral blood film showed normocytic normochromic picture with presence of hypersegmented neutrophils; normal serum iron studies, folic acid levels and red blood cell indices. However serum vitamin B12 levels were decreased to 31.6 pg/ml. All other investigations including ultrasound abdomen, faecal fat estimation, IgA tTG and anti-parietal cell antibodies were normal.

A final diagnosis of vitamin B12 deficiency anaemia secondary to nutritional deficiency was made and patient was put on oral replacement. Her subsequent visit, after 6 months of regular treatment, revealed disappearance of pigmentation and normalization of serum vitamin B12 haemoglobin levels.
Discussion—Hyperpigmentation of skin, especially knuckles, has been reported as a manifestation of vitamin B12 deficiency. Only occasionally, as in the present case, has it been reported as a presenting manifestation of B12 deficiency.¹ The pigmentation is reversible with supplementation of vitamin B12.

The pigmentation can also involve nails. Although the exact mechanism is not known it is believed to be a result of increase in melanin synthesis in B12 deficiency.²

Author information: Vivek Kumar, Senior Resident, Department of Nephrology, Postgraduate Institute of Medical Education and Research, Chandigarh, India; Vishal Sharma, Senior Resident, Department of Medicine, University College of Medical Sciences (University of Delhi), Delhi, India

Correspondence: Dr Vishal Sharma, 19 Gobind Nagar, Chheharta, Amritsar, Punjab, India. Email: docvishalsharma@gmail.com

References:
Use of pricing and tax interventions for protecting health: potential relevance for New Zealand of recent international developments

The New Zealand (NZ) Government uses a number of excise taxes and levies for public health reasons (e.g. on tobacco, alcohol and gambling). It has also previously used other pricing policies for health-related goals, such as subsidised milk for school children, and additional tax to facilitate the phase-out of leaded petrol. Internationally, specific taxes can have public health implications such as decreasing soft drink (soda/pop/carbonated beverage) consumption, and in preventing obesity and chronic disease.

To further advance consideration of pricing and tax policies in the NZ setting, some recent international developments are described below (Table 1). These were all reported on at the World Congress on Health Economics in Toronto in July 2011, which was attended by the first author (NW).

Table 1: New information relating to pricing and tax interventions of potential relevance to public health in developed countries such as New Zealand* (reported at the World Congress on Health Economics, Toronto, July 2011)

<table>
<thead>
<tr>
<th>Topic area</th>
<th>Detail on the evidence and arguments</th>
<th>Potential relevance to NZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco tax – evidence</td>
<td>A summary of the findings of the recently published IARC Cancer Prevention Handbook on tobacco excise taxes and prices was reported. This work highlighted the strong evidence base for this intervention in reducing tobacco consumption, promoting cessation and preventing youth uptake. Also presented was a systematic review which reported that tobacco control programmes were cost-saving or cost-effective (including tobacco excise taxes).</td>
<td>While tobacco tax is a well established intervention in NZ, there is scope for refinements (e.g., making larger and above-inflation tax increases a routine annual event if NZ is truly to become smoke-free).</td>
</tr>
<tr>
<td>Tobacco tax – synergies</td>
<td>A study from Taiwan reported that: “the combination of price strategy (i.e. increase tobacco tax) and non-price strategy (i.e. smoke-free act) seems to have greater impact on motivating smokers to quit than a single strategy”.</td>
<td>NZ could make better use of combining tobacco tax increases with other interventions, as previously suggested.</td>
</tr>
<tr>
<td>Tobacco tax and spill-over benefits for young teens</td>
<td>A US study found that increases in tobacco tax primarily lower youth smoking by discouraging purchase. But taxes also reduced the “social market” for young teens (where cigarettes are obtained by borrowing, buying [illegally], or stealing cigarettes). That is “among 14- through 15-year-olds, a one-dollar tax increase leads to a 0.20 reduction in the probability of borrowing”.</td>
<td>This evidence is relevant to strengthening the arguments for higher tobacco taxes in NZ to prevent uptake by young teenagers.</td>
</tr>
<tr>
<td>Fast-food prices and obesity</td>
<td>A US study found an association between lower fast-food prices and increased obesity. By using an “instrumental variables approach” (an econometric method for getting rid of confounding), the authors considered that they produced more robust results than previous work. As such, this work now provides stronger evidence that lower fast-food prices do have a role in driving recent worsening obesity trends in the US. Another US study found that increased fast-food prices were</td>
<td>This evidence is relevant to strengthening the arguments for considering specific excise taxes on unhealthy food in NZ. More generally, the evidence is increasing that structural...</td>
</tr>
<tr>
<td>Topic area</td>
<td>Detail on the evidence and arguments</td>
<td>Potential relevance to NZ</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Food taxes and subsidies and obesity</strong></td>
<td>Work presented at a Pre-Congress event described modelling of interventions to control obesity. This work reported that the fiscal measures of subsidising fruit and vegetables and taxing foods high in fat would be cost-effective (and actually cost-saving) for European countries in the OECD. Indeed, these fiscal measures were the most cost-saving of the nine interventions studied. A full report on this work has been published.</td>
<td>These approaches are of particular relevance given some NZ research of relevance to food price discounts and political interest in removing GST from fruit and vegetables or various basic foods (Labour Party and Maori Party) and voucher cards for beneficiaries that allow purchasing of food but not tobacco or alcohol (National Party).</td>
</tr>
<tr>
<td><strong>Soft drink (soda) taxes</strong></td>
<td>A study examined the association between state-level soda taxes and adolescent BMI in the US. Preliminary results were that “higher soda tax rates are associated with lower youth obesity prevalence, in particular among low-income youths” and was consistent with the results of previous studies on such beverages. The discussion at this presentation suggested that a number of US states and cities have recently (or are planning to) raise soda taxes (which currently are at relatively low levels in states that use them).</td>
<td>This evidence may contribute to the case for either soft drink taxes or a more comprehensive excise tax on various unhealthy food products in NZ.</td>
</tr>
<tr>
<td><strong>Taxing alcohol, tobacco and unhealthy food</strong></td>
<td>A presentation at a Pre-Congress event described ACE-Prevention modelling work for Australia. Each of the three taxation interventions studied (covering alcohol, tobacco, and unhealthy food) were reported to be cost-saving. A full report on this work has been published, along with a journal article covering alcohol taxation.</td>
<td>Such modelling work is likely to be applied to the NZ situation (Burden of Disease Epidemiology, Equity and Cost-Effectiveness (BODE) Programme; <a href="https://www.uow.otago.ac.nz/BODE3-info.html">https://www.uow.otago.ac.nz/BODE3-info.html</a>).</td>
</tr>
<tr>
<td><strong>Petrol prices</strong></td>
<td>A study using the American Time Use Survey reported that “higher gasoline prices are associated with an overall increase of physical activity that is at least moderately energy intensive. One of the major components of this increase appear to be an increase in moderately energy intensive housework – such as interior and exterior cleaning, garden and yard work, etc” (probably related to lower use of more expensive hired help). In contextualising this work, the presenter referred to another study that found that lower gasoline prices were associated with increased obesity. On a related issue, a US study reported that increases in public transit availability (at the small area level) were associated with a significantly higher probability of exercising by residents. &quot;These findings are particularly strong for White and Hispanic males, employed individuals, and those with middle income”. There was also a “small but statistically significant decrease in BMI” for those with increased public transit availability.</td>
<td>This evidence may contribute to encouraging local NZ research on the health impact of petrol taxes and the potential benefits of subsidising public transport.</td>
</tr>
</tbody>
</table>

Note: The coverage in this table of pricing and tax instruments was focused only on studies for developed countries and on aspects of primary prevention (e.g., pricing around pharmaceuticals is not considered). Furthermore, studies of limited relevance to the NZ situation, are not described.
In summary, there are a number of international developments around pricing and taxation policy of potential relevance to protecting public health in developed countries such as NZ. These interventions could all benefit from further study in the NZ context to identify the potential: implementation costs, health gain, savings to the health sector, and revenue generated for government (e.g., that could allow for tax cuts elsewhere or enhanced health spending elsewhere). In particular, we need to be aware that overall health benefit for the population does not necessarily lead to reductions in health inequalities. This highlights the need for all pricing interventions to be accompanied by studies on the distribution of the costs and benefits to low-income New Zealanders, Māori and Pacific peoples.

Nick Wilson, George Thomson, Tony Blakely
Department of Public Health, University of Otago, Wellington, New Zealand
nick.wilson@otago.ac.nz

Acknowledgements: This work is supported by the Health Research Council (HRC) funded programme: The Burden of Disease Epidemiology, Equity and Cost-Effectiveness (BODE3) Programme (www.uow.otago.ac.nz/BODE3-info.html). But HRC support was not used for conference attendance costs.

References:


Is integrated academic clinical training needed in New Zealand?

Last year I took a year out from clinical training in the UK to work in the department of physiology at the University of Auckland. I had finished my Foundation Year 2 (PGY2 in New Zealand terms), and I needed a change. I had become frustrated with the day-to-day grind of hospital medicine, and felt like I’d spent 2 years just taking blood and writing discharge summaries. It’s fair to say my medical career wasn’t turning out how I’d hoped.

I had however always loved research. Throughout the pre-clinical years at medical school I was just as fascinated by the basic science of disease as clinical signs, and in the clinical years involvement in several research projects made me realise I was as happy writing an abstract as examining an abdomen. The problem was that I had never spent a prolonged period of time in research. Would I enjoy it? Would I be good at it? Could I afford the pay cut?

My year in Auckland was fantastic. The intellectual stimulation, variety and autonomy of the position were superb. I loved the domain of research, feeling as comfortable in the lab as on the ward. But how would I take this forward as a career, especially if I stayed in New Zealand? There was/is no clear training programme, with academics having to carve their own career paths.

Back in the UK, things were different. In 2004, in response to the dwindling number of medical academics, the government created the UK Clinical Research Collaboration¹. They identified the main issues faced by academic trainees as being the lack of clear entry route into academia and the lack of flexibility in the balance between clinical and academic time, and introduced integrated academic clinical training programmes.

After my return to the UK for Christmas, I had the good fortune to be successful in gaining such an integrated post - an Academic Clinical Fellowship (ACF), which I started last August. These posts are designed for PGY3-4 doctors prior to becoming specialty registrars. The post provides a 75%-25% split of my time between clinical training and academia, and maintains my clinical salary. My deanery (equivalent to district health board) provide formal training in clinical research through a post graduate diploma, together with assisting in the search for a suitable academic supervisor/s with whom to develop research projects. After 2-3 years, the goal is to undertake a PhD. Following the PhD, you return to the clinical training programme. At present the UK offers approximately 300 of these posts across all clinical specialties each year, with trainees engaging in research domains from molecular genetics to hospital management.

But is there really a need for such a programme in New Zealand? New Zealand, like most countries, has not been exempt from the international decline in numbers of medical academics. This is not inevitable. Research is obviously enjoyed by medical students in New Zealand, and a recent study in Auckland showed that 35% wished to
be involved in research throughout their career\textsuperscript{2}; very promising numbers. Limiting and aversive factors include the disparity in pay between academics and non-academics and difficulties in protecting research time\textsuperscript{2}. I venture to suggest that a programmes such as ACF, which protect pay and provide time to explore research opportunities, would prove popular in New Zealand.

The question then is really, do such initiatives work? The UK is only beginning to produce its first crop of consultants/senior lecturers from their programme, so data are limited. Internationally, whilst support is high for similar programmes, overall satisfaction and productivity varies, and the attributes of what makes certain candidates and training programmes successful is unclear.\textsuperscript{3}

My personal experience is that having support and supervision at this stage of my career has enabled me to achieve far more than I would without the programme. I don’t have to jump straight in to a PhD in an unfamiliar topic with a supervisor I barely know. The dedicated time enables me to develop an interesting, varied and scientifically robust portfolio with which to secure funding and develop over coming years. However, the negative aspects are that trying to balance increasing clinical training demands in 75\% of the time, whilst also trying to progress in research often leaves me wondering whether I’m jack of all trades and master of none.

On the whole, despite these uncertainties, I would advocate such a training programme in New Zealand. In Auckland I met several gifted medical students and junior doctors who wished to pursue an academic career but didn’t know where to turn. In my opinion, integrated training in selected centres may therefore be able to provide them with the academic training they desire, and New Zealand with the academics it needs.

Michael Keogh
NIHR Academic Clinical Fellow
Newcastle University, UK

References:
On a New Method of Treating Cleft Palate: part 2


It seems a little strange that an operation which is objectionable from a dental point of view should have been devised and practised by a professor of dental surgery.

Methods of Class II are divisible into two varieties, those closing the cleft with the patient's tissues, i.e., by a flap operation, and those closing the cleft with artificial tissues, i.e., a mechanical appliance. Examples of flap operations are the Davis Colley and the Arbuthnot Lane operations.

THE DAVIS-COLLEY operation merely deals with the hard palate, which is the least important part. The soft palate remains to be closed, otherwise, and moreover the closure of the hard palate is rarely complete.

LANE'S FLAP OPERATIONS provide fresh tissue by raising flaps from the palatal and nasal surfaces of the velum and turning them respectively upwards and downwards and suturing them together. The idea is eminently rational and should yield good results. It is, unfortunately, a severe operation and the mortality is comparatively high, though there seems to be a consensus of opinion that Mr. Lane's advocacy of the operation in the first few days of life is open to serious objection. The method of closing the posterior part of the palate before the lip is, I think, good if only for the reason that more room is afforded.

MECHANICAL APPLIANCES are of two varieties—the obturator and the artificial velum; both of which are attached to dental plates which cover the hard palate and thus fill up any deficiency there. The obturator is a solid or hollow mass of rigid vulcanite completely filling up the cleft. An artificial velum is constructed of soft rubber which is deeply grooved laterally to fit the margins of the cleft, and is attached by means of a hinge or spring to the denture.
Hormonal activation of oxytocin and vasopressin neurons by peripheral kisspeptin. V Scott, C Brown. Centre for Neuroendocrinology and the Department of Physiology, Otago School of Medical Sciences, University of Otago, Dunedin.

Kisspeptins are a group of peptides (54-, 14-, 13- and 10-amino acid), derived from translation of the Kiss-1 gene. In 2003 they were found to be critical for fertility via direct activation of gonadotropin-releasing hormone (GnRH) neurons by kisspeptin neurons. In addition to this role in fertility, intravenous (IV) administration of kisspeptin-10 increases oxytocin levels, and intracerebroventricular (ICV) kisspeptin-10 increases vasopressin levels in rats. Oxytocin is important in parturition and is essential for milk ejection, while vasopressin promotes antidiuresis and vasoconstriction. Hence, kisspeptin might play a role in reproductive function and body fluid regulation via stimulation of oxytocin and vasopressin secretion.

Because posterior pituitary hormone secretion is dependent on action potential (spike) discharge, we used in vivo extracellular single unit recording to determine the effects of kisspeptin-10 on supraoptic nucleus (SON) neuron activity in urethane-anaesthetised virgin female rats. Intravenous kisspeptin-10 (100 µg) increased the firing rate of oxytocin neurons (n=12) from 3.7 ± 0.8 spikes s⁻¹ to 4.7 ± 0.8 spikes s⁻¹ (P = 0.0004, Student’s t test) and evoked a short (<3 s) high frequency (>15 spikes s⁻¹) burst of firing in ~25% of vasopressin neurons. By contrast, ICV kisspeptin-10 (2 and 40 µg) did not alter oxytocin (n=15) or vasopressin (n=5) neuron firing rate.

To investigate the pathway involved in mediating the activation of oxytocin neurons by peripheral kisspeptin-10, we used intraperitoneal capsaicin to desensitise vagal afferents, and this prevented the IV kisspeptin-10 induced increase of oxytocin neuron firing rate in all seven neurons tested.

These are the first results to show peripheral, but not central, kisspeptin-10 increases the activity of oxytocin neurons and a proportion of vasopressin neurons. Endogenous kisspeptin regulation of SON neurons is likely indirect via vagal afferent input, with kisspeptin acting as a hormone rather than as a neuropeptide in this system.
Maternal immune activation reduces inhibitory drive in CA1 of the dorsal hippocampus: a potential characteristic of increased risk for schizophrenia development. K Overeem\textsuperscript{1,2}, A Wolff\textsuperscript{2}, D Bilkey\textsuperscript{2}, J Williams\textsuperscript{1}, W Abraham\textsuperscript{2}.

\textsuperscript{1}Department of Anatomy, Otago School of Medical Sciences, \textsuperscript{2}Department of Psychology, University of Otago, Dunedin.

Epidemiological research has identified a link between maternal illness and increased likelihood of schizophrenia. Using the maternal immune activation (MIA) model in rodents we have observed impaired prepulse inhibition; a behavioural perturbation observed in schizophrenia, along with behavioural and electrophysiological impairments indicative of impaired hippocampal processing. Our aim was to investigate whether MIA, induced by administrating the immunostimulant poly-IC mid gestation, is associated with reduced inhibition in the hippocampus.

Dorsal hippocampal CA1 sections were dissected or fixed and sectioned for western blot (MIA, n = 7 Control n = 7) or immunohistochemical (MIA n = 8, Control n = 8) analysis respectively. We analysed the density of GAD67; an enzyme necessary for synthesis of the inhibitory neurotransmitter GABA. Furthermore, our immunohistochemistry analysis was focused within a subpopulation of cells that contain the protein parvalbumin (PV). Finally, GAD67 levels were correlated with PPI scores.

The western blot analysis demonstrated a significant reduction in GAD67 expression in MIA animals (0.88 ± 0.10 (mean ± sd)) compared to Controls (1.00 ± 0.11) \( t \) (12) = -2.05, \( P = 0.03 \). The correlation between GAD67 expression and PPI was significant for MIA animals (\( r = 0.78, P = 0.02 \)) but not Controls (\( r = -0.28, P = 0.54 \)). Analysis of GAD67 density in PV positive cells revealed no difference between the groups (MIA: 0.92 ± 0.13; Control: 1.00 ± 0.05,) \( t \) (8.7) = -1.49, \( P = 0.09 \), and no correlations (MIA: \( r = 0.12, P = 0.78 \), Controls: \( r = -0.06, P = 0.90 \)).

The results indicate that MIA decreases GAD67 in CA1 and the degree of reduction corresponds with behavioural abnormalities. However, reduced GAD67 was not found within PV positive cell types. Nonetheless, the results suggest that reduced inhibition in the hippocampus may be a feature that contributes to increased risk for schizophrenia development.
Current alcohol consumption and incident dementia

The authors of this study acknowledge that long-term alcohol abuse is detrimental to memory function and can cause neuro-degenerative disease. On the other hand there is evidence that light-to-moderate alcohol consumption may decrease the risk of cognitive decline or dementia. They followed 3202 subjects, 75 years of age or older, without dementia at outset for a 3-year period. Half of them consumed alcohol, in general less than two drinks per day. After controlling for a number of potential confounders current alcohol consumption was associated with a 29% decrease in overall dementia incidence and a 42% decrease in Alzheimer dementia. The authors note that the alcohol consumption may not be causal—perhaps “participants who drink alcohol sensibly also have a healthier lifestyle in terms of physical, dietary and mental perspectives”.


β-blockers in intermittent claudication

Therapy with β receptor blockers (β-blockers) is associated with an improved clinical outcome in patients with cardiovascular diseases, including hypertension. However, their use in those with peripheral arterial disease (PAD) has been limited because of the potential impact on vasomotor tone which can have negative implications, especially in PAD patients with critical limb ischemia. The authors of this study note that newer third-generation β-blockers like carvedilol or nebivolol have vasodilating properties, which might confer these drugs a selective advantage. This report concerns a randomised trial in which patients with intermittent claudication and hypertension were treated with 5mg of nebivolol or 95mg of metoprolol once daily. After the 48 week treatment period, ankle-brachial index and absolute claudication distance improved significantly in both patient groups (P>0.05 for both), with no difference across treatments. Both drugs were equally effective in controlling the hypertension.

We do not have nebivolol in New Zealand but we presume the results would be the same with carvedilol. In any case it would seem that the greatly cheaper metoprolol is an appropriate drug for such patients.

Hypertension 2011;58:148-54.

Non-steroidal anti-inflammatory drugs (NSAIDs) and the risk of atrial fibrillation (AF) or flutter

There has been suspicion that NSAID usage may predispose patients to develop AF. This population based control study from Denmark attempts to elucidate. 32606 patients with AF were matched with 325918 control subjects. They report that 2925 cases (9%) and 21871 controls (7%) were current users of either non-selective NSAIDs or COX 2 inhibitors. Compared with no use, the incidence rate ratio for the association between current use and atrial fibrillation or flutter was 1.33 for non-
selective NSAIDs and 1.50 for COX 2 inhibitors. Adjustments for risk factors, such as heart failure, valvar heart disease, thyrotoxicosis, etc reduce the rates to 1.17 for the non-selective NSAIDs and 1.27 for COX 2 inhibitors. So they conclude that there is a positive correlation that is strongest for COX 2 inhibitors and for new users of the drugs. An editorial writer notes that the association may not be cause and effect and speculate that underlying inflammatory conditions may increase the risk of AF and prompt the use of NSAIDs. However, he recommends they should be used with caution in older patients.

Increased risks for patients with heart failure, atrial fibrillation, or coronary artery disease undergoing noncardiac surgery

Coronary artery disease (CAD) has long been known to be a factor increasing the post-operative mortality rate. Less is known of the effects of heart failure (HF) and atrial fibrillation (AF). This population based cohort study from Canada sets out to evaluate these variables and their effects on post-operative mortality. Data from over 38000 such patients is analysed. They compared outcomes in terms of mortality in four cohorts—non-ischaemic HF, ischaemic HF, CAD and AF. The unadjusted 30-day post-operative mortality was 9.3% in NIHF, 9.2% in IHF, 2.9% in CAD, and 6.4% in AF (each versus CAD, \( P<0.0001 \)). The findings were very similar when the analysis was performed on those undergoing minor surgical procedures such as colonoscopy, cystoscopy or cataract surgery. Interesting and important findings.

Prevention of exacerbations of COPD (chronic obstructive pulmonary disease) with long-term azithromycin

Acute exacerbations of COPD are common and often require hospital admission. They significantly impair quality of life and have a high mortality rate. These researchers note that the macrolide antibiotics have immunomodulatory anti-inflammatory and anti-bacterial effects which would make them suitable for preventing exacerbations of COPD. Accordingly they have performed a randomized trial to determine whether azithromycin decreased the frequency of exacerbations in participants with COPD who had an increased risk of exacerbations but no hearing impairment, resting tachycardia, or apparent risk of prolongation of the corrected QT interval. They randomised 1142 such patients to receive either azithromycin 250mg daily or placebo for one year in addition to their usual care. The azithromycin treated patients had a significant decrease in exacerbations and a significant improvement in their quality of life. They also had a significant increase in hearing decrements. So they regard the treatment as useful. However, this intervention could change microbial resistance patterns which might well be bad news in a wider sense. Anyway it will not take on in New Zealand as we reserve this antibiotic for patients who have cystic fibrosis.

BMJ 2011;342:3450 & 3815.


NEJM 2011;365:689-98.