Happiness, health, and social networks

Psychosocial determinants of health may transfer through social connections

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RESEARCH, pp 23, 28

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Two linked studies, by Fowler and Christakis, and Cohen-Cole and Fletcher, relate to the transmission of health related factors through social networks.[1 2] The concept underlying this new field of research is that behaviours may spread over time from one person to another through their immediate and more distant social contacts. Social epidemiology has established the relevance of social connectedness for health, and social network transmission may be one mechanism through which both beneficial and adverse effects are mediated.[3]

The article by Fowler and Christakis investigated the social transmission of happiness. Happiness is related to several aspects of wellbeing, including better work performance, greater job satisfaction, good family relationships, and a more satisfying social life,[4] but what has it got to do with health? It is no surprise that happiness is reduced when people are ill, and that negative emotional states such as depression and anxiety may influence the prognosis of several physical illnesses. But over recent years it has been suggested that happiness influences future ill health.

A recent meta-analysis of longitudinal observational studies found that measures of happiness, cheerfulness, and related constructs were associated prospectively with reduced mortality, both in initially healthy people and in those with established illnesses.[5] These effects were independent of initial health status, age, demographic factors, and risk factors, and they persisted after controlling for negative affective states such as anxiety and depression. These results indicate that happiness is beneficial over and above the absence of misery. However, the analysis may have been subject to publication bias, and no intervention studies showed convincingly that improving happiness has favourable effects on health.

The pathways through which happiness might influence future health are not well established. Evidence relating happiness to health behaviours such as smoking, physical activity, and diet is mixed.[6] More consistent findings have emerged from studies that look at biological outcomes. Happiness has been associated with lower cortisol output over the day, attenuated inflammatory responses, and patterns of heart rate variability indicative of healthy cardiac autonomic control.[7 8] These associations are independent of socioeconomic characteristics and negative affective states. One possibility is that frontal and limbic brain mechanisms that regulate neuroendocrine and autonomic function play a role. Happiness is also related to greater social connectedness and stronger ratings of social support.[9] If, as suggested by Fowler and Christakis, happiness is transmitted through social connections, it could indirectly contribute to the social transmission of health.

Infectious disease epidemiologists have long studied how social networks affect the transmission of infectious agents.[10] As suggested by Fowler and Christakis, behaviours and psychological states relevant to health may also be transmitted from person to person. However, this process is complicated to investigate because, unlike infectious agents, the transmission of behaviours or psychological states cannot be measured directly. Therefore, studies of the transmission of non-infectious outcomes must make a special effort to rule out other reasons for shared behaviours or attitudes among socially proximate people.

Social bonds, especially friendship bonds, are often established between people who share multiple characteristics, including their personal attributes and the environments in which they live and work. Many of these characteristics have been shown to be related to health outcomes and psychological states. This is at the core of the methodological critique by Cohen-Cole and Fletcher[2] and previous debates.[11 12]

Fowler and Christakis make clever use of data from the Framingham Heart Study to investigate whether happiness in the "ego" (a key person in the study) is affected by the happiness of "alters" (people connected to the ego), but because the data were not collected with these analyses in mind they address only indirectly Cohen-Cole and Fletcher's methodological concerns about participants' personal attributes and environments. For example, Fowler and Christakis argue that if unobserved factors drive the association between the happiness of the ego and the alter, directionality should not be relevant. But mutual friends may be more similar to one another than non-mutual friends or alter perceived friends (when the alter thinks of the ego as a friend but this is not reciprocated). Although the results seem to show slightly stronger associations for nearby friends than for nearby alter perceived friends, these two estimates may not really be all that different.

An intriguing finding is that the happiness of next door neighbours is more strongly associated with the happiness of the ego than it is for neighbours in the same block. Fowler and Christakis argue that socioeconomic confounding cannot explain their findings. However, socioeconomic factors (and other individual and environmental factors relevant to happiness) may be highly spatially correlated even at small spatial scales, and including only the educational attainment of the

ego in the regression models probably does not fully account for these confounding effects.

The network and outcome data available to Fowler and Christakis are conditional on participation in one of the Framingham Heart Study cohorts. They therefore included only the close friends, neighbours, coworkers, and relatives of a given ego who elected to participate in the study. An important question is whether pairs of socially connected people who also agree to participate in the same study are more similar than pairs of socially connected people in which one participates but the other does not. Selection could magnify the causal effects of social proximity on health if pairs of friends or neighbours in which both members choose to participate have more influence on each other than those who do not. Omitted variables may also have confounding effects if pairs of friends and neighbours who participate are more similar to each other on unmeasured attributes.

Regardless of the methodological caveats, the work by Fowler and Christakis is groundbreaking in positing the intriguing hypothesis that some psychosocial determinants of health could be transmitted through social connections.[1] The demonstration of these effects has serious implications for our understanding of the determinants of health and for the design of policies and interventions. Future work is needed to verify the presence and strength of these associations using approaches that deal with the remaining methodological concerns, identify the specific processes through which "contagion" effects (to use the infection analogy) operate, and determine with greater specificity the health related variables for which contagion effects are important.

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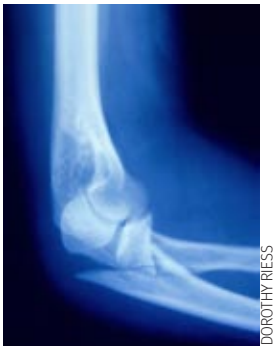
The rational clinical examination in emergency care

We should tell patients that even highly sensitive tests miss some cases



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Understanding the patient's history and interpreting the clinical examination can be challenging in emergencies. Although the immediate presenting problem may be clear—"I've hurt my hand" or "I have a cough"—confounding factors such as pain and anxiety may obfuscate the symptoms and mask the signs. In these circumstances a rational approach to clinical assessment is essential.[1]

The Ottawa ankle rules are probably the most well known and frequently used clinical decision support rules for use in emergencies.[2 3] Evidence based approaches have, however, been developed to help in many other emergency situations, including head injury in adults and children,[4 5] neck injury,[6] knee injury,[7] mandibular trauma,[8] and risk assessment after self harm.[9]

In the linked study, Appelboam and colleagues extend this work with the results of the SWEET study—a multicentre prospective diagnostic cohort study that investigates a simple clinical test (extension of the supine elbow) for detecting elbow fracture.[10] The authors assessed 1740 adults and children with acute elbow injury and found that inability to extend the elbow fully was highly sensitive for the presence of an elbow fracture. They conclude (with a few caveats about olecranon fractures and uncritical use in children) that the two thirds of patients who cannot fully extend their elbows at presentation should be sent for radiography, but that a fracture can be ruled out in the remainder, who need no further tests.

However, knowing that a clinical test that they apply is not infallible seems to worry clinicians more than knowing nothing about a test. Thus the five fractures (out of 316) missed in adults and the 12 (out of 222) missed in children in this study are likely to cause more concern than can be rationally justified. This is probably because a defined risk, however small, seems greater than an undefined one. Furthermore, ignoring a known risk (and therefore missing a fracture in this case) seems less defensible than ignoring an unknown risk. After all, any adverse events that occur when the risk has not been quantified can always be attributed to the inevitability of occasional errors of even expert clinical judgment.

This highlights a serious point. If we are to progress and accept the consequences of rational clinical examination, we need to define how much risk we are willing to accept on our patients' behalf—in other words, how much risk we interpret as no significant risk. In emergency practice, a clinical or laboratory test with 95% sensitivity is often considered to be sensitive enough that a negative test rules out the target condition. By this measure the elbow extension test is easily fit for purpose. At this level of sensitivity we know that 5% of patients with the target condition will have a negative test, but we don't usually say that to patients or think it ourselves. Thus when the

5% chance comes about it is usually seen as an error by the clinicians and the patient.

The level of risk that we accept needs careful consideration to reflect both the clinical consequence of a missed diagnosis and the views of patients. Missing a myocardial infarction is clearly worse from a clinician's perspective than missing a fracture, particularly one with little functional effect. However it is not clear whether patients have the same view—they may expect a clinician to diagnose both conditions with equal certainty. The authors of the SWEET study state that to be clinically acceptable as a single test to rule out elbow fracture, the elbow extension test should have a sensitivity of 99%. They certainly set themselves a hard target—higher than the 97.6% pooled sensitivity of the widely used Ottawa ankle and foot rules.[11] They have been sensibly pragmatic in their conclusions in the face of a measured sensitivity of 98.4%.

But how should we communicate our decisions based on rational clinical examinations, such as the elbow extension test, to our patients? Do we say "You don't need an x ray because you have no fracture," or do we phrase our statements in a more measured way by introducing an appropriate element of doubt? This last approach is certainly more honest and will avoid later accusations of error, but it is more likely to result in an immediate demand for further tests.

The authors of the SWEET study are to be congratulated on extending the reach of the rational examination to the acutely injured elbow. As we apply this and other tools to our patients we should start to view emergency medical practice more as a means of managing risk rather than of making a diagnosis. We then need to share and communicate this with our patients in a way they understand and accept.

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Innovations in publishing *BMJ* research

Less in the print journal is more on bmj.com

RESEARCH, p 37

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The *BMJ* starts 2009 with new ways to publish research. Sheila Hollinghurst, Paul Little, and their colleagues have worked with us to abridge their research paper–an economic evaluation[1] of their recent randomised controlled trial of the Alexander technique for chronic back pain.[2] The full text open access article has already been published on bmj.com, with a video in which the authors discuss the concept, interventions, and interpretation of their work (also available on the *BMJ*'s YouTube channel[3]). Now we are publishing the abridged version in the print journal,[4] with a commentary in our weekly *BMJ* podcast.[5]

We are calling the new abridged print format for research articles *BMJ* pico. It is essentially an extended abstract, similar to those published in *ACP Journal Club* and the BMJ Group's evidence based journals. The abstract gives the research question, study design, and findings, along with details of funding and competing interests. We chose the term "pico" because it means small (10^{-12} in SI units) and is also the name of the widely used critical appraisal tool PICO (population, intervention or exposure, comparison, outcomes), which this new format echoes.

We have been abridging research articles for the print *BMJ* for nearly 10 years using a process called ELPS (electronic long, paper short),[6] which has had mostly positive reactions from readers and authors.[7 8] We believe that *BMJ* pico is an improvement on this format, and we will be inviting all authors of accepted research articles to use it.

Authors will dictate the content for *BMJ* pico—they will produce the short versions themselves using templates that we have developed with experts. *BMJ* pico will allow us to fit more research papers into each print issue, thus offering speedier print publication while saving paper and freeing up resources we would rather spend on improving our services to authors and readers. If we took this approach for all research articles it would mean that authors would not need to work on two long versions of their papers (even the "paper short" version is often several thousand words long), and print readers wouldn't confuse what they read in print with the full version, as sometimes happens now with ELPS. They should also find it easier to quickly grasp the design and key results of a study and decide whether they would like to read it in full on bmj.com.

Why are we doing this now? Firstly, because we are receiving and publishing more research—last year the

BMJ's acceptance rate for original research articles rose from 2% to over 6%—and we want to publish it as quickly and usefully as possible. Secondly, because we believe research belongs online. Many important journals have no print editions, and both authors and readers are now used to the idea of online only publication.

Both online and print versions of the *BMJ* are going from strength to strength, with readership and usage growing steadily. They serve different functions. We want print readers to notice and appreciate research articles, but we know from regular surveys that readership of research in print is lower than for other sections of the journal and much lower than it is online. We also know that some print readers already go to bmj.com when they need the full research article, and we hope that *BMJ* pico will encourage more of them to do this. We hope that authors of research papers will be pleased that their articles are reaching a wide international clinical audience through open access, with many extra features including no word limits, online appendices and other extras, videos, and podcasts, while allowing users to make PowerPoint slides from figures, save articles into online folders and social bookmarking websites, and send rapid responses.[9]

Alongside this first *BMJ* pico we are also publishing a Short Cuts summary of the study.[10] Please tell us your views—as authors and readers—of both versions, by sending rapid responses about them to bmj.com. Which did you prefer to read? Which better conveys both the message and the science? Which would you prefer if you were an author of the study? And, more fundamentally, do you think the *BMJ* would be right to publish only an abstract or a Short Cuts summary of research articles in the print journal and publish the full text online only?

When we launched ELPS in 1999 one reader said "This could go either way. Scaling a mountain and opening the route to others, or landing in the frozen heights."[11] We aim to keep climbing and opening routes to better communication of science, and we have many plans for enhancing—with your help—the ways that the *BMJ* handles and publishes research.

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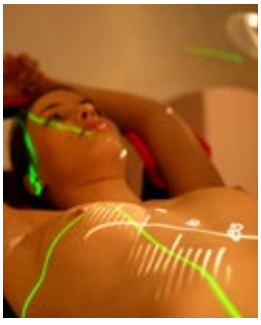
Adjuvant radiotherapy for breast cancer

Changes in delivery must be driven by evidence from ongoing clinical trials



BURGER/PHANIE/REX FEATURES

The incidence of breast cancer is rising worldwide, particularly in women over 50—it increased by 30-40% between 1973 and 1997.[1] In the United States it has decreased by around 10% in line with the reduced use of hormone replacement therapy, but globally the problem is growing.

Since the publication of the landmark National Surgical Adjuvant Breast and Bowel Project B-06, breast preserving treatment consisting of lumpectomy and postoperative radiation has become a widely accepted alternative to mastectomy.[2] The UK Department of Health's 2007 cancer reform strategy underscores the lack of resources allocated to radiotherapy and estimates that an 80% increase in service capacity will be needed by 2016.[3] Lack of equipment and personnel can lead to protracted periods between lumpectomy and breast radiotherapy.[4 5] To implement the strategy, we need to optimise current treatment regimens, adequately invest in radiotherapy infrastructure, develop more efficient radiotherapy techniques, and define when radiotherapy is not needed.

One way of tackling the scarcity of radiotherapy services is to determine more precisely which patients need treatment. Evidence from randomised trials indicates that women aged 70 or more with oestrogen receptor positive, node negative tumours, 2 cm or less, treated with tamoxifen alone had a 4% chance of local recurrence at five years and no significant difference in overall survival with the addition of radiotherapy.[6]

The Postoperative Radiotherapy in Minimum-risk Elderly (PRIME II) study is investigating a similar question in women over 65. Meanwhile, the Selective Use of Postoperative Radiotherapy after Mastectomy (SUPREMO) study is investigating the use of chest wall radiotherapy after mastectomy in women at intermediate risk of local recurrence. If no benefit is found with radiotherapy the demand for radiotherapy could decrease.

However, improving the efficiency of radiotherapy in situations where it is indicated is key—for example, by reducing the number of treatments or changing the mode of delivery (or both). Hypofractionation delivers an equivalent dose of radiotherapy over a reduced time frame by increasing the dose of radiation delivered daily. The UK Standardisation of Breast Radiotherapy Trial (START) compared the delivery of 15 daily fractions with the conventional treatment of 25 daily fractions in early stage breast cancer. The local recurrence rates were equivalent at five years.[7] Similar findings have been

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reported in a Canadian study comparing 16 and 25 fraction regimens.[8] The ongoing Faster Radiotherapy for Breast Cancer Patients (FAST) trial is comparing larger doses (5.7-6 Gy) of radiotherapy given once weekly for five weeks with conventional 2 Gy daily treatment in early breast cancer.[9]

Extended radiotherapy schedules have substantial societal costs, including time away from competing responsibilities, such as family and work, and the financial cost of daily travel to and from the clinic.[10] In the United States these factors have led several women to choose mastectomy over breast conserving surgery, particularly if radiotherapy would require extensive travel.[11]

Because most local recurrences are close to the tumour bed, several techniques have been proposed to target radiotherapy to a smaller volume of breast tissue. These techniques use a greater dose of irradiation per treatment in a reduced time period (accelerated partial breast irradiation). Direct insertion of a radiation source around the tumour cavity using multicatheter brachytherapy is one of the first of such modalities to be tested. Retrospective data show recurrence in the ipsilateral breast in 1-3% of cases after five years.[12] In the US, an increasing number of women are being treated with single catheter brachytherapy, which allows the delivery of 10 fractions over five days. Three year data from a non-randomised study of 1440 patients with early lymph node negative cancers (American Breast Surgeons MammoSite Registry Trial), found a three year actuarial rate of tumour recurrence in the ipsilateral breast of 1.8%.[13] More robust randomised studies are under way to answer this question and provide definitive data on the efficacy and safety of this technique. Intraoperative delivery of a single high dose of radiotherapy at the time of surgery is an alternative technique, and the ongoing randomised prospective Targeted Intraoperative Radiotherapy Trial (TARGIT) will provide more information about this approach.

Any changes in the delivery of radiotherapy must be backed by evidence of, at a minimum, equivalent efficacy and no increased toxicity compared with standard techniques. Because breast cancer can recur years after treatment and current trials have short follow-up periods, many people think that accelerated partial breast irradiation should be restricted to research settings until long term results of randomised studies are available. However, adopting any of these techniques would require substantial investment and modification of current clinical practice around the time of surgery.

Ongoing international trials in breast radiotherapy hold the hope of a more rational and selective use of adjuvant radiotherapy for breast cancer and evidence based improvements in efficacy and delivery. However, financial investment in well trained staff and equipment will be needed for such advances to be tested in clinical trials and then delivered. Investing in better delivery of radiotherapy will not only improve access to radiation services in the United Kingdom, but will benefit society and increase the financial and mental wellbeing of women and their families.

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The future of the quality and outcomes framework

NICE involvement means the framework will remain part of the fabric of primary care

The quality and outcomes framework was introduced into primary care in the United Kingdom in April 2004. The original aims of the framework were to improve the quality of care delivered in general practice, to help recruitment and retention, and to reward practices for the delivery of existing high quality care. Although the scheme is voluntary, 99.8% of practices in the UK participate. The framework currently includes 1000 points in four domains: clinical care (650 points), organisation (167.5), patient experience (146.5), and additional services (36). Average achievement has consistently been over 90%, with a mean score of 96.8% in 2007-8.[1] Framework payments can make up to a third of a practice's income, and the UK

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Competing interests: HL has co-led the academic body that provides academic advice to the BMA and employers' negotiating teams on the development of the quality and outcomes framework since 2005 and carries out research on the effect of the framework. AM's department has received funding for research on the new general practitioner contract from the NIHR SDO Programme.

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government currently spends about £1bn (€1.1bn; $1.5bn) each year (15% of primary medical care costs) on the framework.

Since 2005, academic stewardship of the framework has been provided by a collaboration of more than 40 senior primary care academics, supported by a small working group. It is overseen by a steering committee with representatives from the Royal College of General Practice and lay representatives from the four countries of the UK. The evidence base for existing areas of the framework and any new areas prioritised by the Department of Health is reviewed annually. This is supplemented by information provided by two calls for evidence from patient groups, health professionals, and the public.

Potential indicators are subject to a two stage modified Delphi process. Panels of general practitioners ensure the acceptability and validity of these indicators, and they are also reviewed by the patient partnership group at the Royal College of General Practice. Indicators that are evidence based, score well in terms of necessity, and are thought to be important by patients are presented to negotiating teams of the Department of Health and General Practitioners Committee. Once negotiations are completed, they are made available at the National Primary Care Research and Development Centre website (www.npcrdc.ac.uk/Quality_and_Outcomes_Framework_QOF_.htm).

One problem with the current system is that as the quality and outcomes framework moves from focusing on mostly structural and process indicators in common chronic conditions to a stronger focus on disease prevention and clinical outcomes, it becomes difficult to create good indicators without piloting them. The cost of the framework and the desire to recognise and reward gain in terms of patients' health rather than general practitioners' workload has also led to a necessary focus on the cost effectiveness of each indicator. The Department of Health's new strategy proposes to tackle these problems by making the National Institute for Health and Clinical Excellence (NICE) responsible for developing and reviewing the framework's clinical and health improvement indicators for England from April 2009.[2]

In the new system, according to the public consultation documents (www.dh.gov.uk/en/Consultations/Liveconsultations/DH_089778), interested parties—including patient groups and the public—will be able to submit ideas for priority topics via the NICE website. A primary care consideration panel consisting of a range of experts and representatives will meet twice a year to consider the relative priority of potential new topics.

New indicators will be developed largely from existing NICE guidance and piloted with a representative group of practices for six months. All new indicators will be time stamped, and existing ones will be reviewed and retired once a certain level of achievement has been maintained. New and existing indicators will also be explicitly reviewed for cost effectiveness. A menu of worked up indicators with predetermined thresholds and points will then be published before negotiations. During the first four years of the new system, about 10 new clinical indicators will be introduced each year, and each of these may replace an existing indicator. From 2013, the system will revert to biennial changes of a similar size. From 2011-12, primary care trusts may be able to develop "local quality and outcomes frameworks," enabling them to focus their quality improvement strategies on matters of local concern. The use of nationally validated indicators would also allow comparisons at practice level across both time and place. These proposed changes are currently subject to public discussion with a range of stakeholders and may, of course, change as a result of the consultation.

These proposals as they stand have several implications for patients and practitioners. The explicit move towards a greater focus on measuring outcomes at practice level may create problems because many outcomes are related to the social and demographic characteristics of the population, rather than the primary care they receive.[3] This could create perverse incentives for doctors not to register sicker patients or those with more complex problems.[4] One way to overcome this would be to develop quality indicators that are adjusted for patient characteristics such as comorbidity, disease severity, socioeconomic status, and ethnicity. Another would be to focus on developing intermediate outcome measures. Although indicators that have reached a ceiling should ideally be removed from the framework, we do not yet know what happens to performance under these conditions. This suggests a need to monitor the ongoing achievement of retired indicators. The weight attached to cost effectiveness is unsurprising given the cost of the framework, but it is also important to recognise the lack of evidence and the complexities of developing robust methods in this area.[5] Structural, diagnostic, and measurement indicators are particularly difficult to address in this respect. The proposals to allow local indicators and for NICE to focus on England could also signal the potential devolution of the framework.

Perhaps, most interestingly, publishing a menu of worked up indicators before negotiations could help to reduce the influence of wider political imperatives on the content of the framework. This may become the most important and enduring consequence of this change.

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4 Koshy E, Millett C. The "quality and outcomes framework": improving care, but are all patients benefiting? *J R Soc Med* 2008;101:432-3.
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