

smoking, poor nutrition, and excessive alcohol use—are at least quantifiable, so it is easier to study the effects of specific interventions.<sup>5</sup>

Physical inactivity can be measured using a pedometer, which can be provided to each employee with encouragement to walk for 30 minutes every day. Smoking can be measured by cotinine concentrations and banned on premises, and there could be a ban on hiring smokers (allowable in 39 US states). Unhealthy eating and obesity can be monitored through body mass index, waist size, and portion sizes. People can be advised to eat five servings of fruits and vegetables a day, and the organisation can help them do this by making healthy food available and unhealthy food less so. Alcohol intake can be quantified.

Evidence shows that programmes to manage stress in the workplace have beneficial effects. Much of the best work in this field comes from Japan, where workplace stress is high—more than 60% of Japanese workers report high levels of anxiety and stress.<sup>6</sup> Two recent randomised controlled trials showed that single session educational programmes for supervisors, compared with no programme, can significantly improve knowledge,<sup>7</sup> reduce psychological distress in workers, and improve job performance.<sup>6,8</sup> One programme that taught stress management in hospitals decreased the frequency of malpractice claims (arguably a proxy in the United States for preventable medical errors) in 22 hospitals by 71% compared with a 3% decrease in hospitals without a stress management programme.<sup>9</sup> Such a programme also decreased physician (and nurse) burnout and improved physician (and nurse) satisfaction with work.<sup>10,11</sup>

The NICE guidance implies that the difficulty in measuring stress should not deter organisations from trying to reduce it. Organisations will be more successful if employees help their workers to manage stress.<sup>9</sup>

The science of reducing stress in the workplace is in its infancy, and completing the circle from business policies to improved clinical outcomes is far away. In the meantime, the NICE guidelines can provide some basic advice for businesses wishing to make an impact on productivity and their employees' health.

**Competing interests:** All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare that: (1) MFR has received no financial support for the submitted work; KWR has support from Cornell University and RealAge for the submitted work; (2) MFR has received a salary from and is employed by the Cleveland Clinic, which may have an interest in the work, and founded and sold his shares in RealAge to Hearst in December 2007; MFR serves on the scientific advisory board of RealAge, which might have an interest in the submitted work; KWR has no relationships with companies that might have an interest in the submitted work; (3) their spouses, partners, and children have no financial relationships that may be relevant to the submitted work, except they had ownership interests in RealAge, which were sold in December 2007; and (4) MFR writes books that deal with this subject and leads the Wellness Institute of the Cleveland Clinic and thus has non-financial interests that may be relevant to the submitted work. KWR has no non-financial interests that may be relevant to the submitted work.

**Provenance and peer review:** Commissioned; not externally peer reviewed.

- 1 National Institute for Health and Clinical Excellence. Promoting mental wellbeing through productive and healthy working conditions: guidance for employers. 2009. [www.nice.org.uk/nicemedia/pdf/PH22Guidance.pdf](http://www.nice.org.uk/nicemedia/pdf/PH22Guidance.pdf).
- 2 Sainsbury Centre for Mental Health. Mental health at work: developing the business case. Policy paper 8. 2007. [www.scmh.org.uk/pdfs/mental\\_health\\_at\\_work.pdf](http://www.scmh.org.uk/pdfs/mental_health_at_work.pdf).
- 3 Matthews KA, Gump BB. Chronic work stress and marital dissolution increase risk of posttrial mortality in men from the multiple risk factor intervention trial. *Arch Intern Med* 2002;162:309-15.
- 4 Rosengren A, Hawken S, Ounpuu S, Dans T, Avezum A, Lanus F, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11 119 cases and 13 648 controls from 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:953-62.
- 5 US Centers for Disease Control. Chronic diseases and health promotion. [www.cdc.gov/chronicdisease/overview/index.htm](http://www.cdc.gov/chronicdisease/overview/index.htm).
- 6 Nishiuchi K, Tsutsumi A, Takao S, Mineyama S, Kawakami N. Effects of an education program for stress reduction on supervisor knowledge, attitudes, and behavior in the workplace: a randomized controlled trial. *J Occup Health* 2007;49:190-8.
- 7 Anderson R. Stress at work, the current perspective. *J R Soc Promot Health* 2003;123:81-7.
- 8 Takao S, Tsutsumi A, Nishiuchi K, Mineyama S, Kawakami N. Effects of the job stress education for supervisors on psychological distress and job performance among their immediate subordinates: a supervisor-based randomized controlled trial. *J Occup Health* 2006;48:494-503.
- 9 Jones JW, Barge BN, Steffy BD, Fay LM, Kunz LK, Wuebker JL. Stress and medical malpractice: organizational risk assessment and intervention. *J Appl Psychol* 1988;73:727-35.
- 10 Krasner MS, Epstein RM, Beckman H, Suchman AL, Chapman B, Mooney CJ, et al. Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. *JAMA* 2009;302:1284-93.
- 11 Pipe TB, Bortz JJ, Dueck A, Pendergast D, Buchda V, Summers J. Nurse leader mindfulness meditation program for stress management: a randomized controlled trial. *J Nurs Adm* 2009;39:130-7.

## Acupuncture transmitted infections

Are underdiagnosed, so clinicians should have a high index of suspicion

Acupuncture, which is based on the theory that inserting and manipulating fine needles at specific acupuncture points located in a network of meridians will promote the harmonious flow of “Qi,” is one of the most widely practised modalities of alternative medicine. Because needles are inserted up to several centimetres beneath the skin, acupuncture may pose risks to patients. One of the most important complications is transmission of pathogenic micro-organisms, from environment to patient or from one patient to another.

In the 1970s and 1980s most infections associated with acupuncture were sporadic cases involving pyogenic bacteria.<sup>1</sup> So far, more than 50 cases have been described globally. In most cases, pyogenic bacteria were transmitted

from the patient's skin flora or the environment because of inadequate skin disinfection before acupuncture. In localised infections, meridian specific and acupuncture point specific lesions were typical. About 70% of patients had musculoskeletal or skin infections, usually in the form of abscesses or septic arthritis, corresponding to the site of insertion of the acupuncture needles.<sup>1,2</sup> A minority had infective endocarditis, meningitis, endophthalmitis, cervical spondylitis, retroperitoneal abscess, intra-abdominal abscess, or thoracic empyema.<sup>3,4</sup>

As in other musculoskeletal or skin infections, *Staphylococcus aureus* was the most common bacterium responsible, accounting for more than half of the reported cases.<sup>1,2</sup> Although most patients recovered, 5-10% died

**Patrick CY Woo** professor  
pcywoo@hkucc.hku.hk  
**Ada W C Lin** specialist  
**Susanna K P Lau** associate  
professor

**Kwok-Yung Yuen** chair of  
infectious diseases, Department of  
Microbiology, University of Hong  
Kong, Hong Kong

Cite this as: *BMJ* 2010;340:c1268  
doi: 10.1136/bmj.c1268

**Response on bmj.com** “This kind of article could easily create an unhealthy scare in the public against acupuncture when there is minimal evidence here that current practices are actually problematic. The authors mostly talk about spread of infection in a setting that no longer exists. Every acupuncturist in the United States is bound by clean needle standards to single use, sterile needles.” Steven Mavros, president, Association for Professional Acupuncture, PA, USA  
 To submit a rapid response, go to any article on bmj.com and click “Respond to this article”

of the infections and at least another 10% had serious consequences such as joint destruction, paraplegia, necrotising fasciitis, and multiorgan failure.<sup>1,2</sup>

Apart from pyogenic bacterial infections, five outbreaks of hepatitis B virus infection associated with acupuncture, which affected more than 80 patients, have been described globally since the 1970s.<sup>5,6</sup> In most outbreaks the sources were infected patients, and the virus was transmitted from one patient to another through improperly sterilised or unsterilised reusable acupuncture needles, but in one outbreak an acupuncturist who was positive for hepatitis B surface antigen and hepatitis B e antigen was thought to be the source.<sup>5,6</sup>

The other two major bloodborne viruses, hepatitis C virus and HIV, could hypothetically be transmitted by acupuncture. Most evidence for the association of hepatitis C virus infection with acupuncture came from epidemiological and case-control studies, where acupuncture was found to be an independent risk factor for hepatitis C virus infections.<sup>7</sup> Although no clear evidence exists to support a link between acupuncture and HIV infection, there are reports of patients with HIV who had no risk factors other than acupuncture.<sup>8</sup>

A new clinical syndrome has emerged in the 21st century—acupuncture mycobacteriosis—which is mainly caused by rapidly growing mycobacteria.<sup>9</sup> These mycobacteria are thought to be transmitted from the environment to patients via contaminated equipment used in acupuncture, such as cottonwool swabs, towels, hot pack covers, and boiling tanks. All mycobacterial infections associated with acupuncture so far have been characterised by localised meridian specific and acupuncture point specific lesions without dissemination.<sup>9,10</sup> The lesions usually first appear as erythematous papules and nodules

that subsequently develop into large pustules, abscesses, and ulcerative lesions after several weeks to months. Patients tended to delay seeking medical advice because of the slowly developing and relatively mild symptoms. Owing to the relatively hardy nature of mycobacteria,<sup>10</sup> the long incubation period of the infection, and the difficulty in making a diagnosis, mycobacteria have caused two large outbreaks associated with acupuncture, which affected more than 70 patients.<sup>11,12</sup>

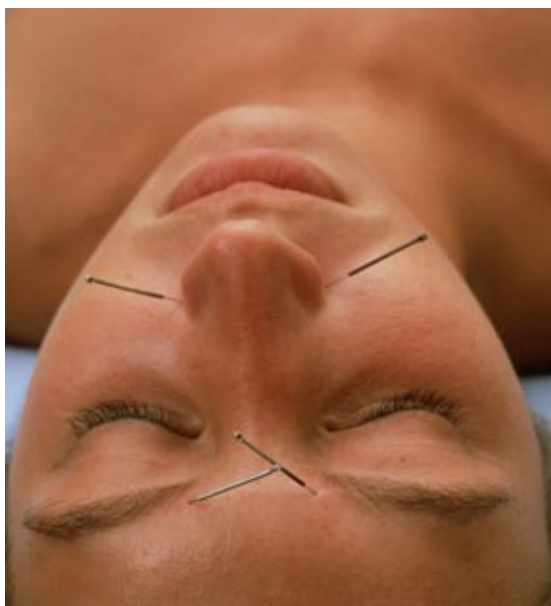
The case reports and outbreaks of acupuncture transmitted infections may be the tip of the iceberg. The first reports of methicillin resistant *S aureus* (MRSA) transmitted by acupuncture appeared in 2009.<sup>3</sup> The emergence of community associated MRSA infections may aggravate the problem. To prevent infections transmitted by acupuncture, infection control measures should be implemented, such as use of disposable needles, skin disinfection procedures, and aseptic techniques. Stricter regulation and accreditation requirements are also needed.

Clinicians should also have a high index of suspicion, particularly for viral and mycobacterial infections transmitted by acupuncture because of their prolonged incubation periods, and they should alert health authorities about clusters of cases.

**Competing interests:** All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare that all authors had: (1) No financial support for the submitted work from anyone other than their employer; (2) No financial relationships with commercial entities that might have an interest in the submitted work; (3) No spouses, partners, or children with relationships with commercial entities that might have an interest in the submitted work; (4) No non-financial interests that may be relevant to the submitted work.

**Provenance and peer review:** Not commissioned; externally peer reviewed.

- Izatt E, Fairman M. Staphylococcal septicaemia with disseminated intravascular coagulation associated with acupuncture. *Postgrad Med J* 1977;53:285-6.
- Woo PC, Lau SK, Yuen KY. First report of methicillin-resistant *Staphylococcus aureus* septic arthritis complicating acupuncture: simple procedure resulting in most devastating outcome. *Diagn Microbiol Infect Dis* 2009;63:92-5.
- Lee RJ, McLlwin JC. Subacute bacterial endocarditis following ear acupuncture. *Int J Cardiol* 1985;7:62-3.
- Vucicevic Z, Sharma M, Miklic S, Ferencic Z. Multiloculated pleural empyema following acupuncture. *N Engl J Med* 2004;350:1763.
- Boxall EH. Acupuncture hepatitis in the west Midlands, 1977. *J Med Virol* 1978;2:377-9.
- Kent GP, Brondum J, Keenlyside RA, LaFazia LM, Scott HD. A large outbreak of acupuncture-associated hepatitis B. *Am J Epidemiol* 1988;127:591-8.
- Kweon SS, Shin MH, Song HJ, Jeon DY, Choi JS. Seroprevalence and risk factors for hepatitis C virus infection among female commercial sex workers in South Korea who are not intravenous drug users. *Am J Trop Med Hyg* 2006;74:1117-21.
- Vittecoq D, Mettetal JF, Rouzioux C, Bach JF, Bouchen JP. Acute HIV infection after acupuncture treatments. *N Engl J Med* 1989;320:250-1.
- Woo PC, Li JH, Tang W, Yuen K. Acupuncture mycobacteriosis. *N Engl J Med* 2001;345:842-3.
- Woo PC, Leung KW, Wong SS, Chong KT, Cheung EY, Yuen KY. Relatively alcohol-resistant mycobacteria are emerging pathogens in patients receiving acupuncture treatment. *J Clin Microbiol* 2002;40:1219-24.
- Song JY, Sohn JW, Jeong HW, Cheong HJ, Kim WJ, Kim MJ. An outbreak of post-acupuncture cutaneous infection due to *Mycobacterium abscessus*. *BMC Infect Dis* 2006;6:6.
- Tang P, Walsh S, Murray C, Alterman C, Varia M, Broukhanski G, et al. Outbreak of acupuncture-associated cutaneous *Mycobacterium abscessus* infections. *J Cutan Med Surg* 2006;10:166-9.



TIM MALYON AND PAUL BIDDLE/ISPL