Institution: University of Lincoln

Unit of Assessment: Allied Health

Title of case study: Improving influenza and pneumococcal vaccination rates in primary care

1. Summary of the impact

Research by the Community and Health Research Unit (**CaHRU**) has had broad international and national impact on community-based prevention, influencing influenza and pneumococcal vaccination policy and practice in the UK, North America and Australia, and impacting on general practitioner and primary healthcare. This has led to improvements in influenza vaccination in the elderly aged 65 years and over as well as younger people aged two years and over at risk of influenza and pneumonia, in Lincolnshire, UK and internationally via policy, education and guidance since 1999.

The research has increased public and practitioner awareness of the link between influenza and cardiovascular disease and the potential for influenza vaccination to prevent acute myocardial infarction (AMI) and stroke. It has affected international vaccination policy; through the findings being incorporated into national guidance for general practices and e-learning on how to improve UK influenza vaccination rates. Overall there has been a substantial take-up of our findings and recommendations.

2. Underpinning research

Context

Influenza (flu) is a common, potentially severe, but preventable infection that places a high burden on patients and healthcare providers. A safe, effective vaccine is offered annually by general practices to at-risk groups in the UK. People in at-risk groups, comprising 27% of the population, have a higher chance of contracting severe flu infection or its complications.

There are 36/100,000 population deaths per year in the UK (an additional 12000 per year) due directly to influenza, and of these, approximately two-thirds are in a vaccination risk group. However, only a quarter of those at risk receive vaccination and uptake of seasonal influenza vaccination in the UK's at-risk population is below the national and international target of 75%.[1]

Furthermore two-thirds of influenza deaths are due to respiratory disease but a third are due to cardiovascular disease (AMI or stroke). There is increasing interest in the theory that respiratory infection particularly influenza, might trigger rupture of coronary artery plaques which is thought to cause AMI, because known risk factors do not fully account for all cases of AMI. [2,3]

This case study demonstrates a central theme of our research activity which is ***translational research relating to quality improvement in health and social care***. The research is both evaluative, i.e. shows which immunisation strategies work best, and exploratory, e.g. identifies important associations between influenza immunisation and prevention of illness or death.

The research programme (2005-ongoing)

***Aims*:** The research aimed to improve uptake of seasonal flu and pneumococcal vaccination in the UK's at-risk population, to investigate the link between respiratory infection and AMI or stroke/transient ischaemic attack (TIA or 'mini-stroke'), and to explore the potential for flu or pneumococcal vaccination to prevent AMI or stroke/TIA.

Staffing: The research was carried out by members of the Primary Care Research Group, part of the Community and Health Research Unit (CaHRU) led by Prof Niroshan Siriwardena (2005-), with Stellamay Gwini (2007-2009) and continuing with Dr Zahid Asghar (2011-) at the university of Lincoln.

Research design and methods:

- We undertook a cross-sectional study to investigate methods for improving flu and pneumococcal vaccination practice.[1]
- We carried out case control and self controlled case series studies to investigate the potential for influenza (and pneumococcal) vaccination to prevent AMI and stroke.[2,3]

Key findings to date:

- We identified key strategies, such as communication between professionals, provider prompts, and practice organisation, that were significantly associated with success of general practice seasonal flu vaccination and pneumococcal vaccination campaigns, and we helped practices to implement these through educational programmes.[1,]
- We conducted a large case-control study which showed that influenza vaccination, but not pneumococcal vaccination, was associated with a reduced rate of first acute myocardial infarction and this finding was confirmed in a self-controlled case series study.[2,3]

3. References to the research

All publications below were in peer reviewed international journals (team members highlighted):

1. Dexter LJ, Teare MD, Dexter M, **Siriwardena AN**, Read RC. Strategies to increase influenza vaccination rates: outcomes of a nationwide cross-sectional survey of UK general practice. BMJ Open 2012; 2:e000851 doi:10.1136/bmjopen-2011-000851. [1 citation]
2. Gwini SM, Coupland C, **Siriwardena AN**. The effect of influenza vaccination on risk of acute myocardial infarction: self-controlled case-series study. *Vaccine* 2011; **29**: 1145-1149 (doi:10.1016/j.vaccine 2010.12.017). [13 citations]
3. **Siriwardena AN**, Gwini S, Coupland C. Influenza vaccination, pneumococcal vaccination, and the risk of acute myocardial infarction: matched case-control study. *Canadian Medical Association Journal* 2010**; 182** (15): 1617- 1623. (doi:10.1503/cmaj.091891) [22 citations]

Funding sources
The funding sources for this research programme were all high quality, peer reviewed competitive awards from the National Institute for Health Research (NIHR):

- Read RC, Dexter L, Teare D, Clark A, Dexter M, **Siriwardena AN**. Understanding and improving seasonal influenza vaccination practices in primary care. Policy Research Programme PR-SI-0311-10017, June 2011 – June 2012, £88,346.
- **Siriwardena AN**, Gwini S, Coupland C. Case-control of potential for influenza and/or pneumococcal vaccination in prevention of stroke and transient ischaemic attack (IPVASTIA). NIHR: Research for Patient Benefit. September 2009 – September 2011, £103,000.
- **Siriwardena AN**. Coupland C, Meade T. Case-control of potential for influenza and/or pneumococcal vaccination in prevention of acute myocardial infarction (IPVAMI). NIHR: Research for Patient Benefit. April 2007 – December 2009, £55,322.

4. Details of the impact

Our research has increased public and professional awareness internationally on the potential link between influenza and AMI and the potential for influenza vaccination to prevent AMI. It has also had benefits for professional policy and practice, by contributing to better understanding of barriers to vaccination of adults against influenza and S. pneumoniae (a bacterium which causes community acquired pneumonia, meningitis and blood poisoning), and developing and testing

methods which have improved vaccination rates in high risk groups.

A number of our large scale studies[4,5] had a direct effect on primary care practice (general practitioners, practice nurses and primary healthcare teams) for organisation of influenza and pneumococcal vaccination programmes, and increased rates of vaccination for vulnerable people which is known to prevent ill-health and death and reduce health service costs. A key factor for success was that practitioners were involved in the conception and design of the work.

The context to our work was our research in Lincolnshire which had local impact through increased influenza and pneumococcal vaccination rates in high-risk groups during 2000 to 2001 in a large primary care organisation where we undertook an organisational intervention involving 32 of 39 practices: there were improvements in vaccine rates in patients with heart disease (19% increase in influenza vaccination; 15% increase in pneumococcal vaccination), diabetes (17% increase in influenza vaccination; 13% increase in pneumococcal vaccination) and over 65 year olds (24% increase in influenza vaccination).[4] Assuming 1000 patients were eligible for vaccination in each practice, with an average of three GPs per practice, and a change of 20% in vaccination rate in 39 practices, this equates to an additional 6400 patients vaccinated, and over 60 GPs and their staff involved during the course of this study. The number needed to treat to prevent one death is 120, (http://eurheartj.oxfordjournals.org/content/30/2/209.full) which means that around 50 deaths would have been prevented through this intervention.

A further context is provided by another study which led to increased influenza and pneumococcal vaccination rates in high-risk groups in Lincolnshire that we conducted during 2001, involving a similar organisational intervention in 22 of 105 practices: there were significant improvements in vaccine rates in patients with heart disease (11% increase in influenza vaccination; 28% increase in pneumococcal vaccination), diabetes (9% increase in influenza vaccination; 29% increase in pneumococcal vaccination) and patients with a splenectomy (17% increase in influenza vaccination; 16% increase in pneumococcal vaccination).[5] There were again over 60 GPs involved, with approximately 4400 additional patients receiving influenza and pneumococcal vaccination, and prevention of around 37 deaths as well as hospitalisations.

Our case-control study showing a reduction in AMI with influenza vaccination[3] raised wide-reaching public awareness of a potential benefit of flu vaccine in preventing heart attacks. The paper published in 2010 led to television and media coverage worldwide receiving more than 1,000 news items in major international media from the UK, US, India, China as well as Canada and other countries. (e.g. CBC News, radio interviews (Radio 5 Live UK, Radio Cyprus, Voice of America, CBS news), a video interview with Time Magazine and around 1,000 professional and public websites worldwide (e.g. Reuters, CNN, Claire).

We undertook a cross-sectional study in 2012 investigating factors associated with success of practice seasonal flu vaccination campaigns which showed strategies that if widely implemented by general practices would improve average flu vaccination rates by 7% to 8%.[1] This has been publicised by the research team in a popular practitioner magazine,[8] and translated by the research team into an e-learning module,[8] with positive feedback from GPs who reported they would use this knowledge in practice.

In addition, the recommendations from this study were incorporated in widely circulated national guidance for UK health services in the 'Seasonal flu plan: Winter 2012/13, Annex E Increasing vaccine uptake among clinical risk groups – GP Practice checklist' and in the letter from the UK Chief medical Officer on 'The Flu Immunisation Programme in 2012/13 and 2013/14' (Annex B GP practice checklist).[9]

The research[3] has also been widely cited in international and UK guidance for practitioners, for example in the Canadian Influenza Immunization Awareness Campaign (2013-2014),[10] the Australian Immunisation Handbook (2013)[11] and by the Health Protection Agency UK.[12]

5. Sources to corroborate the impact

4. **Siriwardena AN**, Wilburn T, Hazelwood L. Increasing influenza and pneumococcal vaccination rates in high-risk groups in one primary care trust as part of a clinical governance programme. *Clinical Governance: An International Journal* 2003; **8** (3):200-207.

5. **Siriwardena AN**, Hazelwood L, Wilburn T, Johnson MRD, Rashid A. Improving influenza and pneumococcal vaccination uptake in high risk groups in Lincolnshire: a quality improvement report from a large rural county. *Quality in Primary Care* 2003; **11**: 19-28.

6. News media coverage of Canadian Medical Association study http://www.cmaj.ca/site/misc/about.xhtml [accessed 25-11-13]

7. Davies M. Personal invitations 'boost flu vaccination rates' Pulse 2012. http://tinyurl.com/pofcj9c [accessed 25-11-13]

8. Siriwardena AN. Seven steps to achieving better flu vaccine uptake: e-learning, Pulse 2012 http://www.pulsetoday.co.uk/article-content/-/article_display_list/14158340/seven-steps-to-achieving-better-flu-vaccine-uptake-1-cpd-hour [accessed 25-11-13]

9. Department of Health. The flu immunisation programme 2013/14. http://tinyurl.com/nbso76d [accessed 25-11-13]

10. Immunize Canada http://immunize.cpha.ca/en/diseases-vaccines/influenza.aspx [accessed 25-11-13]

11. Australian Immunisation Handbook 10th edition 2013 http://www.health.gov.au/internet/immunise/publishing.nsf/Content/handbook10-4-7 [accessed 25-11-13]

12. Health Protection Agency. Influenza pandemic preparedness update, Issue 3. HPA Pandemic Influenza Office, 2010 http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1284475129055 [accessed 25-11-13]