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Welcome to the latest issue of your NIHR CLAHRC West Midlands News Blog.



Welcome back to the latest issue of our News Blog where we discuss the factors associated with [de-adoption](#) of technology. We also look at recent articles on links between [vitamin D, calcium, coffee and health](#); the effectiveness of contraceptive provision on [fertility control](#); the benefits of [health insurance](#); the impact of training on [cognitive decline](#); the effectiveness of [intraperitoneal chemotherapy](#) for ovarian cancer; and the accuracy of computer [algorithms for predicting crime](#).

Further we have the latest [PPI update](#); [news and events](#); [funding](#) opportunities; this issue's [quiz question](#); showcase some of our [latest publications](#); and have a [reply](#) to a recent blog.

We hope that you find these posts of interest, and we welcome any comments. You can find previous issues of our News Blog [here](#).

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Factors Associated with De-Adoption

CLAHRC WM News Blog readers know about factors associated with adoption of new technology. Where the treatment is within the gift of a single clinician, then the following barriers / facilitators determine the probability of adoption:

1. The strength of the evidence.
2. Prior beliefs – when a person has no strong opinion, then evidence of given strength will be more influential than when it must compete with strong prior beliefs.[\[1\]](#) For example, I would take some convincing that homeopathy is effective.
3. Psychological approach – when the new evidence requires practitioners to give up something they are accustomed to doing, then change is harder to achieve. (X-rays came into routine use within four years of [Röntgen's](#) discovery, while antisepsis took over a generation.)
4. Psychological predisposition – according to Rogers, some people are psychologically predisposed to be early adopters or laggards (but this can be specific to the technology concerned).
5. Role models and other forms of influence from the social environment.
6. The presence of subconscious 'clues' in the environment – nudge theory.[\[2\]](#)
7. Financial incentives at the personal level – but watch out for perverse effects.

When adoption is not in the gift of individual clinicians, the organisation as a whole has to respond. Many barriers / facilitators can be encountered.

1. Changing supply chains so that the appropriate technology is available and can be maintained. This is a large barrier in low-income countries.
2. Arranging for training / education when a new technology supplants an existing technology.
3. Support across the organisational hierarchy to send out the right social 'signals' (see also above).
4. Co-ordination across barriers – different professions and across organisational boundaries. We have discussed barriers and facilitators to cross-border facilitation in previous blogs.[\[3\]](#)
5. Financial incentives at the organisational level,[\[4\]](#) although again these can have negative side-effects.[\[5\]](#) [\[6\]](#)
6. Fit with established workflows and the immediate demands of a situation – a particular problem with IT, as described in previous blogs.[\[7\]](#) [\[8\]](#) Put simply, the more disruptive the technology, the harder change is to achieve and the greater the risk that any adoption will introduce new risks.

All of the above problems require an organisation to have time and people to help solve problems – the concept of [absorptive capacity](#), which has been explored in our CLAHRC.[\[9\]](#)

But what about de-adoption; does that have different features? This topic was studied in a recent issue of the BMJ. [\[10\]](#) They looked at different individual features associated with de-adoption of carotid revascularisation procedures that are falling from vogue, but which are still indicated in some cases. Here clinicians should 'exnovate' by scaling back rather than eschewing the procedure completely. More experienced physicians and smaller practices were associated with faster exnovation, but patient factors, strangely, were not. The authors suggest that early adopters tend to be early de-adopters. Far from convincing me that there is something special about de-adoption / exnovation, the evidence actually presented did not suggest that the factors are qualitatively different to those associated with adoption in the first place.

-- Richard Lilford, CLAHRC WM Director

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CLAHRC WM Quiz

What is Metcalfe's Law?

Email [CLAHRC WM](#) your answer.

Answer to our previous quiz: Credence goods are goods with qualities that **cannot be observed by the consumer** after purchase, making it difficult to assess its utility. Typical examples of credence goods include expert services, such as medical procedures, automobile repairs and dietary supplements.

PPI

PPI Advisor Meets Royal Visitors to Coventry

On Tuesday 16 January 2018 one of CLAHRC WM's PPI Advisers, Debs Smith, had the privilege of meeting the Duke and Duchess of Cambridge during their visit to Coventry University.

Debs and two other colleagues spoke about their public involvement work, with a particular focus on their involvement in teaching activities to help students understand what it's like to live with and care for people who have mental health

issues. The royal couple then spent time understanding more about communication difficulties, and both the Duke and Duchess learnt a 'wiggle' dance, which is used to communicate with people who have complex communication needs.

More information about the visit to Coventry, which includes a short video of the visit, can be accessed [here](#).

-- Magdalena Skrybant, PPIE Lead

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Director's Choice - From the Journals

Corroboration of Previous Reports on Vitamin D and on Coffee

In recent News Blogs we have provided evidence that vitamin D and calcium are useless in preventing osteoporotic fractures in elderly people with no obvious risk factors.[\[1\]](#) [\[2\]](#) This is now powerfully corroborated in a paper in JAMA by Zhao, et al., [\[3\]](#) who carried out a systematic review and meta-analysis involving over 50,000 participants. They found absolutely no beneficial or harmful effects of either vitamin D or calcium or a combination of the two compared to placebo in reducing the risk of either vertebral hip or other non-vertebral fractures. The absolute risk difference was zero with an upper confidence limit of 0.01. Hopefully this puts the matter to bed once and forever.

Likewise a recent umbrella review in the BMJ [\[4\]](#) corroborated previous news blogs on the generally health promoting effects of coffee.[\[5\]](#) It would appear that these benefits are also seen in equal measure with de-caffeinated coffee, suggesting that it is the other components of coffee that benefit health.

-- Richard Lilford, CLAHRC WM Director

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Is Fertility Control a Demand or Supply-Side Issue?

In China population control has been achieved by coercive means. But in other countries it must be controlled by increasing access to contraceptives or by stimulating demand by non-coercive means. Where does the main barrier lie in low- and middle-income countries? Miller and Babiarz (2016) tackle this old chest - not by means of a systematic review. They include only experimental and instrumental variable-based studies.[\[1\]](#)

They find few RCTs. The most famous of these experiments is the *Matlab* study in

Bangladesh,[\[2\]](#) where 141 areas were randomised in a cluster trial. The intervention group received visits every two weeks by community reproductive health workers who provided information and access to contraception. This intense, and arguably unscalable, intervention yielded a drop in fertility of about 20% over a lifetime. A slightly smaller effect was found in a further trial, this time of 37 clusters in Ghana. However, the two remaining RCTs consisted of family services that were grafted onto an existing program (HIV services in Kenya and micro-credit in Ethiopia), and both yielded null results.

Instrumental variable studies depend on a sudden increase or decrease in supply that does not seem to be attributable to a change in demand. Mostly these take the form of a stepwise roll-out of services (Iran after 1989; Colombia in 1965) and find reductions of around 20% infertility. Likewise fertility increased and then decreased in Romania when a ban on abortion, the main method of contraception in that country, was imposed and then lifted.[\[3\]](#) I guess the best one can say is that, absent China style enforcement, contraceptive provision is a necessary, but not sufficient condition for fertility control.

-- Richard Lilford, CLAHRC WM Director

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The Benefits of Expanding Health Insurance in the US

The Oregon experiment, which we have cited previously,[\[1\]](#) was of limited scale and follow-up was for two years only. It is the only RCT in expanded insurance in the US and shows improvements in financial security, improved perceived health, increased use of services, and less depression. Other health outcomes were not affected. Was this because of its limited sample size and short follow-up? Probably yes, given the results of a number of natural experiments involving other plans, such as the Massachusetts insurance plan,[\[2\]](#) various studies of the Affordable Care Act,[\[3\]](#) and a study of Medicare when it was introduced nationwide back in the 1960s.[\[4\]](#) The resulting evidence is neatly summarised in a recent article in the New England Journal of Medicine.[\[5\]](#) The evidence is not conclusive by the very nature of the topic. However, taken in the round, the evidence suggest that public payment for health service yields real health benefits, but it is likely that these benefits take many years to materialise.

-- Richard Lilford, CLAHRC WM Director

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Does Physical or Cognitive Training Slow Decline in Cognition with Age, or Delay the Onset of Dementia?

Two careful reviews in the *Annals of Medicine* review current trial evidence.[\[1\]](#) [\[2\]](#) This is a hard topic to study because interventions are heterogeneous; outcomes are multiple and vary between studies, and long-term follow-up is required. As far as exercise is concerned, the evidence is simply insufficient. Cognitive training reduces cognitive decline in the particular cognitive task targeted by the training, but does not seem to produce a global effect. These studies were both based on people with normal functioning at baseline.

-- Richard Lilford, CLAHRC WM Director

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Intraperitoneal Chemotherapy for Ovarian Cancer

The CLAHRC WM Director hates ovarian cancer - it spreads throughout the abdominal cavity and is horrible to behold it at surgery. He has often wondered if topical chemotherapy could help control this dreaded disease. In the UK one in 52 women will be diagnosed with ovarian cancer within their lifetime, with around 7,400 new cases and around 4,100 deaths in 2014.[\[1\]](#) Standard treatment is surgery to excise the tumour, followed by intravenously administered chemotherapy, or vice-versa. Can topical (intraperitoneal) chemotherapy improve outcomes compared to the standard intravenous method? Previous research of combined intravenous and intraperitoneal chemotherapy has shown an increase in overall survival in patients with ovarian cancer, but there are a number of limitations that have affected widespread adoption. Researchers in the Netherlands conducted a study to see if delivering the intraperitoneal chemotherapy immediately after surgery could show similar effectiveness, while overcoming these limitations.[\[2\]](#)

This was a randomised trial of 245 patients with ovarian cancer who had already undergone three cycles of chemotherapy. Patients underwent surgery with hyperthermic intraperitoneal chemotherapy (HIPEC) administered at the end of the procedure or not, followed by another three cycles of chemotherapy. HIPEC is where the abdomen is heated prior to applying the chemotherapy drugs. This hyperthermia results in a number of cellular reactions, including increasing the penetration of chemotherapy drugs into the tissue, impairing the ability of cancer cells to repair DNA, thus increasing their sensitivity, and inducing apoptosis.

Results showed significantly fewer deaths and disease recurrence in those patients who underwent HIPEC during surgery, than in those who did not (hazard ratio 0.66, 95% CI 0.50-0.87; $p=0.003$). Further the patients in the HIPEC group had a median recurrence-free survival of 14.2 months, compared to 10.7 months. At follow-up (median of 4.7 years), 62% of patients who had undergone surgery without HIPEC had died, compared to 50% of patients who had received HIPEC ($p=0.02$). Median

survival was 45.7 months compared to 33.9 months. Adverse events were similar in both groups.

-- Peter Chilton, Research Fellow

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How Accurate are Computer Algorithms Really?

The use of computers to replace tasks previously done by hand continues to become more prevalent, from using machine learning to analyse database studies,^[1] to algorithms that recommend whether someone should receive a bank loan or be shortlisted for a job interview. Another area that uses such predictive algorithms is in the criminal justice system, where they are often used to predict criminal behaviour, such as locations of crime 'hotspots', the likelihood of whether defendants will attend their court hearing, and/or whether someone will reoffend. However, there is concern as to the accuracy and fairness of these systems.^[2]

In an article in *Science Advances*,^[3] Dressel and Faris compared a commercially available criminal risk assessment tool against assessment by untrained participants on accuracy of deciding whether a defendant would reoffend within two years. These participants were recruited via an online system and paid \$1, with a bonus of \$5 if the accuracy of their predictions was high (to incentivise them to treat the task seriously). The computer algorithm assessed 137 features of 1000 defendants and their past criminal record, while the volunteers were given a statement containing seven features (sex, age, criminal history) of a subset of 50 defendants. Comparing the results showed no significant difference ($p=0.045$) between the accuracy of the algorithm (65.2%) and the participants (62.8%). Pooling the participant responses ('wisdom of the crowd') showed similar accuracy (67.0%) ($p=0.85$). Further analysis showed that participants' prediction accuracy were slightly more sensitive and less biased than that of the algorithm; while they were similar in terms of fairness regarding race of the defendant. Perhaps with participants who are well versed in criminal justice, or who are well trained, their accuracy could be higher than that of the computer?

The authors then went on to recreate the accuracy of the commercial computer algorithm using a simpler standard linear predictor, and found that inputting only two features (age and total number of previous convictions) gave results as accurate as the algorithm using 137 features.

-- Peter Chilton, Research Fellow

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News & Events

PROMs Conference 2018



Registration is now open for the next PROMs (*Patient Reported Outcomes Measures*) Research Conference, which will be hosted by the [Centre for Patient Reported Outcomes Research](#) at the University of Birmingham on **20 June 2018**.

The event will include plenary sessions, oral presentations and posters, and will bring together leading international experts, clinicians, patient partners, and early career researchers to engage with the latest advances in the field of PROMs research and implementation.

Oral and poster abstracts are being invited on the following themes:

- Minimising PROs waste, in research and beyond.
- Pushing the boundaries of PPI in PROs research.
- Digital capture of PROs.
- Cutting-edge methods.

The deadline for [abstract submission](#) is **28 February 2018**.

For more information, and to register to attend, please visit: birmingham.ac.uk/PROMs2018.

RCGP Midland Faculty Annual Education, Research & Innovation Symposium

Keele University are hosting this interactive day on **Thursday 17 May 2018** for students, GPs, registrars, researchers, and allied health professionals. The event aims to inspire, translate, and innovate primary care research by showcasing current research. Guest speakers include Prof Roger Jones (Editor, BJGP), Prof David Fitzmaurice (University of Warwick), and Prof Helen Stokes-Lampard (Chair,

RCGP). Registration is open until 30 April 2018, and abstracts can be [submitted](#) until **25 February 2018**. For more information, [please see here](#).

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Funding

PhD Opportunity

A PhD opportunity is available at the University of Birmingham for a project on developing structured clinical handover tools for non-communicable diseases in India. For more information, please [view this poster](#), or visit [Find a PhD](#). The deadline for application is **Friday 23 March 2018**.

NIHR Funding

The following funding opportunities are available from the NIHR Public Health Research programme:

- 18/04 [Interventions to prevent or reduce gambling-related harm](#).
- 18/05 [Interventions for looked-after children and young people that aim to enhance quality of life](#).
- 18/06 [Enabling people to live well with dementia through interventions in a community setting](#).
- 18/07 [Rural health](#).

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Selected Replies

Re: [Machine Learning and the Demise of the Standard Clinical Trial!](#)

I enjoyed this... I agree with the general points whole-heartedly, that machine-learning should not be relied upon to magically solve the problems that bedevil observational studies in EMRs.

I'm not sure I'd make a blanket statement that ML cannot correct for selection into treatment, unless it were part of a broader (possibly overly rigid) philosophy that rejects anything but randomization as doing so.

I'd say ML can do about as well as other methods of correcting for selection based on observables, but has the exact same limitations when it comes to any selection that may be on the basis of un-observables. So there may be some limited problems where virtually all of the basis for selection into treatment is on variables available in

the dataset. In that case ML will do fine, as will propensity scores or matching algorithms and at best ML will do marginally better.

Analytically, I will go out on a limb (although I think pretty safely) to say that in health services research nobody has ever demonstrated that ML does sufficiently better than more traditional modelling to justify its use. If so I'd like to see the citation. Obviously I have left myself some wiggle room by saying "sufficiently better" but I have never been convinced yet by an argument that it can do so.

The primary advantage of ML is that you can do pretty well building models automatically that have automatic updating. So if low stakes, OK models that can be generated in an unsupervised way are your goal (like suggestions on Amazon, or movie lists) then it is great. But for healthcare purposes I don't see it yet.

Poorly supervised or structured ML will merely reproduce the biases in the data itself, and the black box nature of ML may in fact raise the problems in that regard.

In an analogous way this has been demonstrated rather dramatically by some of the algorithms in google and other online AI applications which inadvertently manage to reproduce negative cultural and racial stereotypes in their classification algorithms. (see an engaging video by Kate Crawford of Microsoft on this topic <http://blog.revolutionanalytics.com/2017/12/the-trouble-with-bias-by-kate-crawford.html>)

-- Tim Hofer

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Recent Publications

Chandan JS, Thomas T, Lee S, Marshall T, Willis B, Nirantharakumar K. [The Association between Idiopathic Thrombocytopenic Purpura and Cardiovascular Disease: a retrospective cohort study](#). *J Thromb Haemost*. 2018.

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Madigan CD, Pavey T, Daley AJ, Jolly K, Brown WJ. [Is weight cycling associated with adverse health outcomes? A cohort study](#). *Prev Med*. 2018; 108: 47-52.

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Tucker KL, Taylor KS, Crawford C, Hodgkinson JA, Bankhead C, Carver T, Ewers E, Glogowska M, Greenfield SM, Ingram L, Hinton L, Khan KS, Locock L, Mackilop L, McCourt C, Pirie AM, Stevens R, McManus RJ. [Blood pressure self-monitoring in pregnancy: examining feasibility in a prospective cohort study](#). *BMC Pregnancy Childbirth*. 2017; **17**(1): 442.

Wu P, Gulati M, Kwok CS, Wong CW, Narain A, O'Brien S, Chew-Graham CA, Verma G, Kadam UT, Mamas MA. [Preterm Delivery and Future Risk of Maternal Cardiovascular Disease: A Systematic Review and Meta-Analysis](#). *J Am Heart Assoc*. 2018; **7**: e007809.

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