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ARC West Midlands News Blog

Early vs Delayed Tracheostomy in Pneumonia

Richard Lilford, ARC WM Director

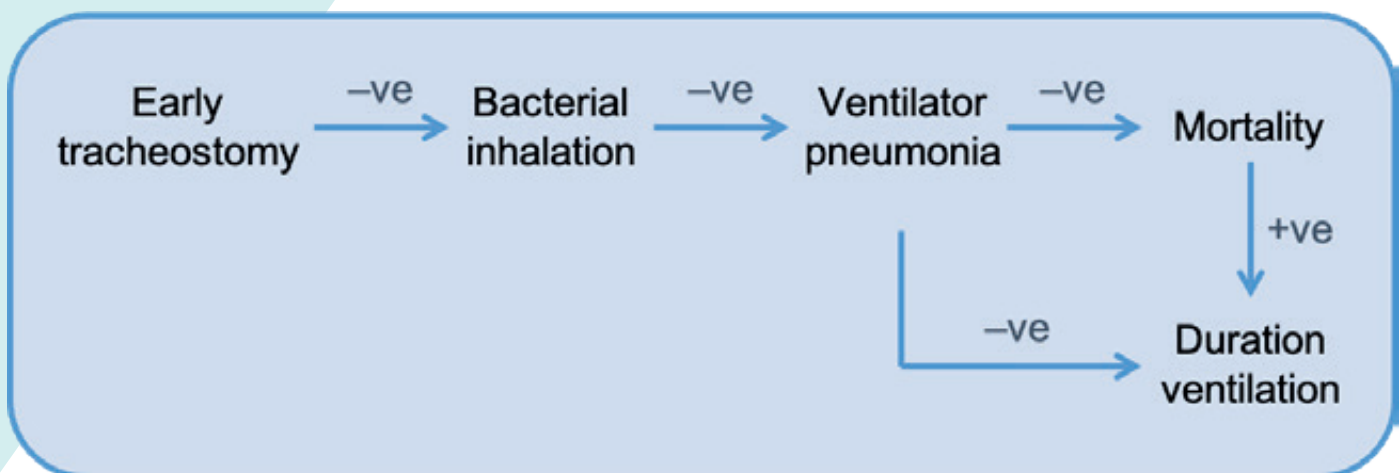
In previous News Blog articles I have railed against misusing hypothesis tests as decision rules,[1][2] and I am accumulating a series of examples of the fatal error of conflating these two things.

My interest in tracheostomy for ventilated patients was piqued by a conversation with ENT surgeon Neil Sharma. He was arguing in favour of early tracheostomy in patients with COVID-19 pneumonia. This made me wonder about the relative merits of early versus delayed tracheostomy across pneumonia as a whole. I contacted ARC WM collaborator Julian Bion, who alerted me to a recent meta-analysis by Deng and colleagues.[3]

The analysis included 15 RCTs, and the authors found no statistical difference in short-term mortality or ventilator pneumonia. They did, however, find a statistically significant reduction in intensive care unit stay and duration of mechanical ventilation in favour of early tracheostomy.

The authors conclude that ‘tracheostomy was not associated with short term clinical end points [death or pneumonia]’. In my opinion this conclusion is totally unwarranted. There was a 13% reduction in the risk ratio of death and a 10% reduction in the risk of ventilator pneumonia. The P values were 0.1 and 0.15 respectively.

Rather than analyse every individual point statistically, or even worse correct for multiple observations, it would make much more sense to look for a hypothesised pattern in the data. The interpretation of the pattern should turn on the theory or causal chain on which the study was predicated. The theory is that tracheostomy will reduce the risk that oropharyngeal bacteria will get into the lungs. This theory is supported by microbiological evidence. The causal model holds that by short-circuiting the laryngeal route, tracheostomy will reduce microbiological contamination of the lung. This in turn might be expected to reduce ventilator associated pneumonia, and pneumonia is a mediator of death and duration of ventilation, and hence hospital stay. Hence the causal pathway in the below figure.



Our statistical model should be designed to examine the causal model shown in the figure. Thus, the effect of the mediator should be explored through structural equation models. We should examine for the hypothesised correlation between death and reduced duration of ventilation allowing for competing risks.

It is likely that such an analysis would provide support for early tracheostomy, especially if analysed using Bayesian methods, thereby avoiding the error of conflating hypothesis tests with decision rules. In this case I suspect that failure to take this causal approach was a genuinely fatal error.

References:

1. Lilford RJ, Kudrna L. Science Denial and the Importance of Engaging the Public with Science. *NIHR ARC West Midlands News Blog*. 2020; **2**(11): 5-6.
2. Lilford RJ. To Subgroup or Not to Subgroup? *NIHR ARC West Midlands News Blog*. 2020; **2**(12): 1-2.
3. Dong H, Fang Q, Chen K, Zhang X. Early versus late tracheotomy in ICU patients: A meta-analysis of randomized controlled trials. *Medicine*. 2021; **100**(3): e24329.

ARC WM Quiz

What is the Scoville scale?

email your answer to: ARCWM@warwick.ac.uk



Answer to previous quiz: The Brier score is a way to **verify the accuracy of a probability forecast**, taking into account the outcome of the event predicted as well as the estimate.

Congratulations to Alan Hargreaves who was first to answer correctly.



Launching the ARC WM Public Involvement Strategy

Dr Magdalena Skrybant, PPIE Lead

It is with great pleasure that we announce the launch of our Applied Research Collaboration for the West Midlands **Public Involvement Strategy** - now available on our [ARC WM website](#).

Our Strategy, which sets the direction of travel for Public Involvement in ARC WM, was created over six months between October 2020 and March 2021. Whilst a core group of eight Public Contributors was instrumental in shaping the Strategy, the final version was a real team effort: our Public Contributors, researchers, Theme leads, managers and the ARC WM Director all influenced the final version.

The Strategy includes a vision statement, setting out what we want to achieve in ARC WM regarding involving the public in our research, which is underpinned by five strategic aims.

A delivery plan records, in detail, how we will deliver our Strategy, with milestones to make sure we keep on track.

Our Vision Statement

“Involving and engaging people from diverse backgrounds across the West Midlands in collaborative research. This will drive service improvement to make lasting benefits in health, social care and wellbeing for individuals, their families and communities.”

1 Enhancing diversity in our involvement and engagement and including communities under-represented in research.

Building on both foundations and experiences from CLAHRC WM to embed public involvement practices, which facilitate partnership working and enable the public to have real influence at Project, Theme and Central levels in ARC WM.

3 Developing skills and capacity in the ARC WM Community (contributors, researchers and staff working in health and social care services) to deliver meaningful PPI/E across ARC WM.

Collaborating with public involvement colleagues locally, regionally and nationally to achieve continual improvement of PPI/E through sharing resources, learning and examples of best practice.

5 Embedding a culture of gathering feedback, evaluating and reporting PPI/E to capture the impact of public involvement and contribute to the evidence-base.

We know that writing the Strategy is just the first step on a long journey. Now the Strategy has been written and published on our website, the real work in delivering our Strategic Aims begins.

[Wayne Murray](#), founder of Humanity Square, and charity strategist, recently said:

‘Your strategy isn’t a document. It’s a set of mutually agreed decisions, created by all and owned by all. The document is just the receipt.’

I couldn’t have put it better myself.

Nurse to Patient Ratios and the Outcomes of Hospital Care

Richard Lilford, ARC WM Director

The above thorny issue was one of those included in a systematic overview of patient safety interventions to which the ARC WM Director contributed.[1] The effect of nurse patient ratios on clinical outcomes is a difficult subject to study, and the literature includes few evaluations with contemporaneous controls.

News blog reader Gus Hamilton drew my attention to a comparative study in the Lancet.[2]. This is one of my favourite types of study, where researchers take advantage of an opportunity to evaluate an expensive intervention implemented by the policy maker.[3]. The opportunity arose in the state of Queensland, which implemented a minimum nurse to patient ratio in some hospitals but not in others. The researchers compared outcomes in the 27 intervention hospitals with those of 28 comparison hospitals at baseline and again at two years post-intervention.

The study was based on 231,902 admissions overall. There was a highly statistically significant decrease in mortality in the intervention hospitals of about 10%, and no corresponding change in the control hospitals. Length of stay decreased more rapidly in the intervention than in the control hospitals. Apparently, the intervention was 'dominant', in the sense that not only were outcomes improved, but net costs were also reduced.

Should we believe that this was cause and effect? Based on this article alone, probably not. However, taken in the round, and considering the literature as a whole, the evidence becomes more compelling.

Still, a note of caution must be sounded. As explicated in previous news blogs,[4] a cause-and-effect explanation would be more compelling if the mediating variables, such as more vigilant monitoring, had also been explored. In recent work involving our ARC WM we found little effect of consultant presence on either process or outcome variables.[5][6]

References:

1. Shekelle PG, et al. [The top patient safety strategies that can be encouraged for adoption now.](#) *Ann Intern Med.* 2013;**15**(5pt2):365-8.
2. McHugh MD, et al. [Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of stay: a prospective study in a panel of hospitals.](#) *Lancet.* 2021; **397**: 1905-13.
3. Lilford RJ. [Service Delivery Research: Where Has All the Low Hanging Fruit Gone?](#) *NIHR ARC West Midlands News Blog.* 2021; **3**(3): 1-3.
4. Lilford R, Watson S. [Use of Causal Diagrams to Inform the Analysis of Observational Studies.](#) *NIHR ARC WM News Blog.* 20 Nov 2020; **2**(11): 1-2.
5. Bion J, et al. [Changes in weekend and weekday care quality of emergency medical admissions to 20 hospitals in England during implementation of the 7-day services national health policy.](#) *BMJ Qual Saf.* 2020.
6. Watson SI, Lilford RJ, Sun J, Bion J. [Estimating the effect of health service delivery interventions on patient length of stay: A Bayesian survival analysis approach.](#) *J Roy Stat Soc.* [In Press].



REF Evaluates Research, but can Research Evaluate the REF?

Richard Lilford, ARC WM Director

The REF 2021 has recently been submitted, and the ARC WM director is a proponent of the system. It provides a publicly accountable justification for the quality-related research (QR) component of university funding. Those who oppose the REF should be careful what they wish for. The REF allows universities to maintain their autonomy while receiving about £2 billion of public money for research.[1]

However, the exercise itself cost £246,000,000 in 2014.[2] Even if this is an over-estimate, as I suspect, the mechanism itself needs to be examined and streamlined. And some of the evidence to guide the process must reside in the REF submissions themselves. The research community has steadfastly opposed using bibliometric methods of assessment in order to assess institutions.[3] The ARC WM director makes bold to disagree with the research community! The arguments against bibliometric assessment are mostly valid only at the level of an individual and get ironed out at the level of a university. Moreover, we now have the evidence to make a formal comparison of bibliometrics versus the REF methodology. This comparison would serve as a kind of ‘equivalence trial’. We could also evaluate different bibliometric

methods, for example those that do or do not weight outcomes in favour of specialities with lower average impact. It is crucial to distinguish the idea of use of metrics at an institutional level, a good idea, from use of metrics to judge individuals, which is much more problematic. [4]

The method used to assess research should become the subject of research.

References:

1. Nature. [Will the latest UK Research Excellence Framework turn out to be the last?](#) *Nature*. 2020; **578**: 338.
2. Farla K, Simmonds P. [REF Accountability Review: Costs, benefits and burden Report by Technopolis to the four UK higher education funding bodies](#). Brighton, UK: Technopolis Group; 2015.
3. Traag VA, Waltman L. [Systematic analysis of agreement between metrics and peer review in the UK REF](#). *Palgrave Commun*. 2019; **5**: 29.
4. Else H. [Row erupts over university’s use of research metrics in job-cut decisions](#). *Nature*. 2021; **592**: 19.

Routinely Collected Data vs Bespoke Data Collection

Richard Lilford, ARC WM Director

An absolutely fascinating study comparing the results of randomised trials of a given treatment using routinely collected data versus trials of the same treatment using bespoke data collection methods.

News Blog readers will know that the ARC WM director is a proponent of trials that use routinely collected data. Examples include our recent trial of nudge theory to improve uptake of influenza vaccine by frontline staff.[1] Since bespoke data collection is enormously more expensive than simply harvesting data from routine systems, the latter offers huge cost savings and can reach very large sample sizes. But could the routine data trials also be more accurate? On the one hand, routine systems are limited by the amount of data that can be collected from any one trial participant. In addition, there may be coding and other errors. On the other hand, however, data collection is completely independent of the trial in routine systems and might therefore be less biased.

In a recent outstanding study in the BMJ,[2] 84 trials using routine systems were compared with 463 standard trials across 22 clinical questions. The authors found that it was the trials based on routine data that produced the most conservative estimates of treatment benefit on average.

The trials covered a very wide range of clinical, public health and service delivery interventions, but, across almost all of the studies, the routine data studies produced more conservative estimates. The results remained similar across

various sensitivity analyses regarding data sources and likely quality of the data. In any event, these data are reassuring for the [Margaret Peters Centre](#), which specialises in routine data collection and analysis, and which is proposing to do more trials using routine data outcomes.

References:

1. Schmidtke KA, Nightingale PG, Reeves K, Gallier S, Vlaev I, Watson SI, Lilford RJ. [Randomised controlled trial of a theory-based intervention to prompt front-line staff to take up the seasonal influenza vaccine. *BMJ Qual Saf.* 2020; **29**\(3\): 189-97.](#)
2. McCord KA, Ewald H, Agarwal A, et al. [Treatment effects in randomised trials using routinely collected data for outcome assessment versus traditional trials: meta-research study. *BMJ* 2021; **372**: n450.](#)

Is it Worth Screening All Patients for Ovarian Cancer?

Peter Chilton, Research Fellow

Over half of patients with ovarian cancer receive their diagnosis when the disease is at stage III or IV (considered advanced), and subsequently have a poor survival rate (27% survival at five years for patients with stage III, and 13% for stage IV). [1] However, where the cancer is detected while at stage I, survival rates are above 90%. It has therefore been argued that increasing screening for ovarian cancer would save lives – however, evidence so far is lacking.

A recent paper in the *Lancet* reports on a multi-centre randomised trial - the UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS). [2] The ARC WM Director has a long association with this trial as he was responsible for arranging payment of treatment costs for the original trial. Over a period of almost 4½ years, data were obtained for more than 200,000 women attending 13 centres in England, Wales and Northern Ireland. These women were randomly allocated to receive either annual multimodal screening (MMS) (25%), annual transvaginal ultrasound screening (USS) (25%), or no screening (50%). Median follow-up was for 16.3 years, at which point 2,055 women had been diagnosed with tubal or ovarian cancer. This was split proportionally similar between the groups, with around 1% of each group being diagnosed – 522 in the MMS group, 517 in the USS group and 1,016 in the group with no screening. Mortality was also similar, at around 0.6% of each group.

Overall, analyses showed that the incidence of stage I or stage II cancer was 39.2% (95% CI 16.1-66.9) higher in the MMS group compared to the no screening group; while for stage III or stage IV cancer the incidence was 10.2% lower (95% CI -21.3-2.4). (There were no differences seen in the USS group.) This reduction in stage III or IV cancer in the MMS group did not translate into a significant improvement in lives saved. There were no significant reductions in deaths from ovarian or tubal cancer in either the MMS (p=0.58) or USS (p=0.36) groups compared to the no screening group. Screening was not shown to reduce deaths from ovarian or tubal cancer at a significant level, so the authors are not able to recommend screening of the general population. This study may be a good example of rate and lead-time biases in epidemiological studies; cancers detected at early stage differ systematically from those detected earlier clinically.

References:

1. Cancer Research UK. [Ovarian cancer survival statistics](#). 2018.
2. Menon U, Gentry-Maharaj A, Burnell M, et al. [Ovarian cancer population screening and mortality after long-term follow-up in the UK Collaborative Trial of Ovarian Cancer Screening \(UKCTOCS\): a randomised controlled trial](#). *Lancet*. 2021.

A close-up photograph of a person's hands holding two items. The left hand holds a whole, bright green apple. The right hand holds a partially eaten donut with orange frosting and colorful sprinkles. The person's fingernails are painted a light blue color. The background is blurred, showing what appears to be a white lab coat.

Cardiovascular Issues in Childhood Linked to Cognitive Performance in Middle Age

Peter Chilton, Research Fellow

As populations age, more thought is being given to preventing cognitive problems, such as poorer memory, learning and decision-making. Various cardiovascular risk factors, such as high blood pressure, adverse serum lipids and high BMI have been linked to poorer cognitive performance, but there is little evidence regarding the accumulation of such risk factors from childhood onwards. The authors of a recent paper looked at a population-based cohort of 3,596 children from Finland (3-18 years old at the outset), who had been followed for a period of 31 years – from 1980 till 2011.[1] During this period blood pressure, serum lipids and BMI were regularly recorded. At the end of the period, cognitive testing was conducted in 2,026 participants (aged 34-49 years old).

Analyses found that consistently high systolic blood pressure, high serum total cholesterol and obesity from childhood were associated with poorer cognitive performance in middle age (including worse episodic memory, associative

learning, visual processing and sustained attention). Further, the higher the number of cardiovascular risk factors seen in a person, the worse the observed cognitive performance.

Based on these results it may be beneficial to look at strategies that can reduce cardiovascular risk factors from childhood onwards, in order to improve future cognitive health.

Reference:

1. Hakala JO, Pahkala K, Juonala M, et al. [Cardiovascular Risk Factor Trajectories Since Childhood and Cognitive Performance in Midlife: The Cardiovascular Risk in Young Finns Study. *Circulation*. 2021; 143: 1949-61.](#)

Latest News and Events



Be Part of Research Campaign

The NIHR have recently launched their **Be Part of Research** campaign, aiming to help the public find out about health and social care research that is taking place across the UK.

There are a number of studies taking place into many health conditions, including COVID-19 vaccines and treatments. The latest news and information are available at: bepartofresearch.org.

nhr.ac.uk, or health professional can provide updates on opportunities to take part in research, as things are changing quickly.

Taking part in research is particularly important at this time. Please continue to access healthcare research or other healthcare services, even while COVID-19 restrictions are in place, unless you hear otherwise.

Cerebra Network Online Launch Event

The *Cerebra Network for Neurodevelopmental Disorders* are holding the official launch of their network on **3 June 2021**, with an exciting day of online talks. There will be a Family Focus Session (10am - 12:15pm), aimed at parents and carers of people with neurodevelopmental

disorders and their families; and a Research Focus Session (1pm - 3:45pm) aimed at academics and professionals, though anyone is welcome to attend throughout the day.

You can register and submit questions at: www.cerebranetwork.com/launchevent

National NIHR ARC Newsletter - May



The May issue of the national NIHR ARC newsletter is now [available online](#), with reports on effectiveness of in-person vs online intervention sessions for mental health services for children; ethnicity health issues due to COVID-19; and a chatbot created to address people's concerns about COVID-19 vaccines.

To subscribe to future issues, please visit: <https://tinyurl.com/ARCSnewsletter>.

Postgraduate Research Opportunity

An MSc on *Reducing health inequalities through increased screening in people with intellectual disability* within our Youth Mental Health theme is currently available. Details are

available at: <https://warwick.ac.uk/fac/sci/med/study/researchdegrees/howtoapply/hs>. Application deadline is **24 June 2021**.

NIHR Research Design Service North West is offering an online event on developing funding proposals in applied health and social care on **Wednesday 16 June 2021**. This event is for health, social care and public health practitioners and researchers who want to develop and submit their first research grant to an NIHR funding programme (or other national, open-call, peer reviewed funding sources).

The event will include a presentation from a successful first-grant applicant, an overview of RDS support, and guidance on fundamental aspects of the design of a funding proposal including Public Involvement. For more information, and to register, please visit: eventbrite.co.uk/e/your-first-research-grant-funding-proposals-in-health-social-care-registration-151608225283

Developing Funding Proposals

Making Implementation Happen through Capacity and Capability Building: A Virtual Collaborative Learning Event

NIHR ARC North West Coast, together with the local AHSN, are hosting this virtual event on **Tuesday 21 September 2021**.

The event is for those with a role in improving practice in public health and social care through implementation; and is focused on sharing learning on implementation, evaluation, adoption and scaling up of effective interventions in public health and social care, and establishing a collaborative network to support development

of knowledge and skills in implementation and implementation research.

Proposals for poster presentations are invited, of both successful and challenging experiences of implementation and capacity and capability building to improve care for all.

For more information, and to register, please visit: <http://profbriefings.net/index.php/about-mihtccb20>

Health Services Research UK Conference 2021

Registration is now open for this year's Health Services Research UK Conference, which will take place online from **6-8 July 2021**.

A wide range of live plenaries, workshops and discussion groups are being offered, as well as over 150 research presentations that will be accessible on demand.

Plenaries will include:

- Long COVID: patient experience and the

developing research agenda.

- Meeting future challenges for NHS workforce.
- Diversity and inclusion in health and care research.
- Science, evidence and government policy: lessons from the COVID-19 pandemic.

For more information, and to register, please visit: www.eventsforce.net/hsruk2021.

Recent Publications

Barker J, Smith-Byrne K, Sayers O, Joseph K, Sleeman M, Lasserson D, Vaux E. [Electronic alerts for acute kidney injury across primary and secondary care](#). *BMJ Open Qual*. 2021;**10**:e000956.

Caleyachetty R, Barber TM, Mohammed NI, Cappuccio FP, Hardy R, Mathur R, Banerjee A, Gill P. [Ethnicity-specific BMI cutoffs for obesity based on type 2 diabetes risk in England: a population-based cohort study](#). *Lancet Diabetes Endocrinol*. 2021.

Connell C, Furtado V, McKay EA, Singh SP. [Developing an Intervention to Improve Occupational Participation for Justice-Involved People with a Personality Disorder: Defining and Describing Intervention Components](#). *Int J Offender Ther Comp Criminol*. 2021.

Kwok CS, Duckett S, Satchithananda D, Potluri R, Morgan-Smith D, Bellenger N, Gunning M, Mallen C. [The patient, clinician and healthcare perspectives in evaluating care pathways for stable chest pain](#). *Crit Pathw Cardiol*. 2021.

Raja T, Tuomainen H, Madan J, Mistry D, Jain S, Easwaran K, Singh SP. [Psychiatric hospital reform in low and middle income countries: A systematic review of literature](#). *Soc Psychiatry Psychiatr Epidemiol*. 2021.

Shrestha D, Napit IB, Ansari S, Choudhury SM, Dhungana B, Gill P, Griffiths F, Gwyther H, Hagge D, Kandel S, Puri S, Sartori J, Watson SI, Lilford R. [Evaluation of a self-help intervention to promote the health and wellbeing of marginalised people including those living with leprosy in Nepal: a prospective, observational, cluster-based, cohort study with controls](#). *BMC Public Health*. 2021; **21**: 873.

Watson SI & Lilford RJ. [Global COVID-19 vaccine roll-out: time to randomise vaccine allocation?](#) *Lancet*. 2021; **397**: 1804-5.

Yahaya I, Wright T, Babatunde OO, Corp N, Helliwell T, Dikomitis L, Mallen CD. [Prevalence of osteoarthritis in lower middle- and low-income countries: a systematic review and meta-analysis](#). *Rheumatol Int*. 2021.

Zghebi SS, Mamas MA, Ashcroft DM, Rutter MK, VanMarwijk H, Salisbury C, Mallen CD, Chew-Graham CA, Qureshi N, Weng SF, Holt T, Buchan I, Peek N, Giles S, Reeves D, Kontopantelis E. [Assessing the severity of cardiovascular disease in 213 088 patients with coronary heart disease: a retrospective cohort study](#). *Open Heart*. 2021;**8**(1):e001498.