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Implementation and Implementation Science: the Big Disconnect

Richard Lilford, ARC WM Director

The Issue

Implementation science studies adopt many different forms, but there is one point on which they converge. It is a widely accepted tenet of implementation science that the intervention should be comprehensively described.[1] This requirement is all very well, but how does the investigator know what the intervention consisted of? The obvious answer is to refer to an intervention protocol. But what if there is no protocol?

The idea that an intervention, at least if it is the subject of evaluation, must have a protocol is deeply ingrained in health service/implementation science. To suggest otherwise could open a person to an accusation that they are unscientific in their approach. However, the notion that a protocol is a prerequisite of a principled evaluation entails a corollary – interventions implemented without protocols cannot be evaluated by respectable scientists. This would be an acceptable price to pay if any of the following three conditions applied:

1. Interventions are only rarely carried out in the absence of a protocol.
2. Interventions carried out in the absence of a protocol are of a type that would not warrant evaluation.
3. Nothing of value can be learned from the evaluation of an intervention implemented without a protocol.

However, I argue here that none of these conditions are universal.

Interventions May Be Implemented Without a Protocol

It is common for service managers to implement changes without producing a formal protocol. I recently served on the board of a large NHS hospital and was a member of their quality and safety committee. A large number of initiatives were launched, task and finish groups were formed, and actions taken. However, detailed protocols describing the various actions were the exception rather than the rule. Managers just do not spend their days writing TIDieR compliant protocols. In some cases there may be a '*business case*', but that does not amount to a protocol. The SQUIRE guidelines state that "*any reasons or assumptions that were used to develop the interventions*" should be described.[2] However, these may not have been explicit at the time of the intervention. Moreover, it has been found that interventions based on an explicit theory are no more likely to be effective than those not based on an explicit theory.[3] Implementation scientists, habituated to co-production principles where researchers and service managers collaborate on producing an intervention description, might be scandalised at the very thought of intervention sans protocol. Nevertheless, real world service managers frequently intervene without a formal protocol.

An Intervention May Be Effective Even Without a Protocol

It does not follow that an intervention cannot be of interest simply because it does not have a written protocol. We conducted a study of a financial incentive to promote uptake of home haemodialysis in the West Midlands region, showing that it was effective.[4] Yet there was no protocol beyond the financial incentive itself. The fact that an intervention may be interesting and effective, even in the absence of a protocol, is exemplified by the finding that protocols for effective interventions have omitted an essential ingredient for success. This possibility is exemplified by a retrospective study of an effective intervention to reduce sepsis on intensive care wards.[5] The protocol was concerned with implementation of a checklist, while a subsequent retrospective study showed that the checklist by itself was not impactful. Leadership from the person who was overseeing its implementation was the extra, essential, ingredient.[6] The observation that an essential ingredient may be omitted from the protocol of an interesting and effective intervention vitiates the argument that it can not be worthwhile to evaluate an intervention that is implemented without a protocol.

Even Without a Protocol, an Intervention May Still Be Interesting

It could be argued that an intervention with no protocol is not worthy of evaluation. However, there are many examples of interesting evaluations of interventions that were not protocolised. For example, studies of change in the nurse-patient ratio,[7] implementation of forced functions to prevent misconnecting gas supply in the operating theatre,[8] and to increase consultant cover at weekends,[9, 10] were all based on retrospective evaluations of interventions that were not protocolised.

Absent a Pre-Implementation Protocol, It May Be Possible to Engineer a Protocol Retrospectively

Absent an explicit protocol, it may be possible to reconstruct the intervention retrospectively. For example, a recent intervention to implement guidelines to reduce hospital falls was supported by only a minimalist protocol.[11] This intervention was led by a senior nurse who was able to recreate what was done in considerable detail, even though this had not been captured prospectively in a protocol. The very act of reverse engineering a protocol may be helpful to the service. For example, we are evaluating an intervention to improve numerous aspects of leprosy care in the Chhattisgarh Province of India. When we set off on this endeavour, we were guided by a sparse business case that fell far short of the detail required of an intervention protocol. However, we are re-creating the protocol retrospectively by talking to the various actors involved immediately before and after initiation of the project. In this way, we think we may have provided a service to the policy-makers directing the programme. However, a clear line of cleavage between intervention and implementation is not available. Readers of our study results will therefore have to form a judgement about which parts of the description they wish to implement since the project began before we could finish our work.

Protocols are Highly Desirable, Just Not Essential

None of what I have said, however, should be taken as an argument against producing an intervention protocol. On the contrary, and notwithstanding the possibility that the protocol may be incomplete, producing protocols is good practice, and managers and policy-makers should be encouraged to produce such protocols. Also, the existence of a protocol enables the evaluator to draw a clear distinction between the protocol and its implementation.[12, 13] My problem is not with protocols, but with an inflexible attitude insisting that an evaluation must always be accompanied by a prospective protocol.

Conclusion

Insisting that every evaluation is coupled to a pre-standing intervention protocol might do more harm than good. The examples above show that protocols can be reconstructed retrospectively and that, as in the intensive care example, where the reconstructions were more, rather than less, accurate in terms of describing the active ingredients.

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Update on Training and Capacity Development in ARC WM

Sara Muller, Senior Lecturer in Epidemiology & Applied Statistics

When Prof Aileen Clarke retired last September, I was delighted to be appointed as the ARCWM lead for training and capacity development, and to be able to continue with the programme that Laura Kudrna, Kelly Schmidtke and I had been developing with Aileen in the previous 12 months. We have had a series of online "*Early Career Opportunities*" sessions for early/mid-career researchers on topics ranging from applying for grants to asserting yourself in meetings, as requested by those attending the away day we held in June 2021. We also held an ARCWM-wide training event on Equality Diversity and Inclusion (EDI).

Now it is time for us to start thinking about what training we should offer in the final two years of funding and what we propose for ARCWMs successor. As discussed at the Scientific Advisory Group (where a large proportion of the day was dedicated to various aspects of training and capacity development), I'd like to base this on what ARCWM can offer over and above what our host institutions and the wider NIHR infrastructure already provide. Many of the topics we discussed in our early Career Opportunities sessions last year are already covered by these other organisations and I think we can do something else to really add benefits for everyone.

By everyone, I don't just mean people identified as "*early*" or "*mid*" career. Other ARC training leads are proposing the term "*developing researchers*", and I think this is a good description because we are all still learning. Building our training offer on top of what is there in HEIs and the wider NIHR will allow us to provide training that is relevant to everyone, regardless of career stage. With this in mind, I am looking forward to working closely with our Patient and Public Involvement and the (soon to be formed) Equality, Diversity and Inclusion teams to improve everyone's (including my own) skills in these areas. This will involve researchers learning about PPI and, separately, patients learning about research. I am also hoping that we can hold ad hoc sessions to share the knowledge accumulated by individuals and teams across ARCWM on specific topics of wider interest (e.g. data sources available to us).

By using the term developing researchers, I'm not suggesting that less experienced researchers don't have specific needs, and I am very keen that we support people earlier in their careers in ways that suit them. We have tried to create a virtual network but unfortunately this hasn't worked. Instead, we will have an in-person day in the autumn, the date of which is still to be confirmed, but for those attending there will be cake! This will allow everyone to meet each other and tell us what you need in terms of informal support, training and networks.

We also need to build on the Public Health and Social Care summits that have already been held to provide relevant training to our colleagues in NHS and local authority services. This is a key priority for the next 12 months and we have appointed Helen Hunt from the AHSNWM to the Training and Capacity Development committee to lead in this area.

Finally, I would like to extend a huge thank you to Kelly Schmidtke for her work as Deputy Director for Training and Capacity Development at Warwick, as Kelly moves on to new and exciting things overseas. We hope to have a new Training, Capacity and Development Deputy appointed at Warwick soon.

If anyone has any comments about the plans I've set out, or wants to ask any questions, please get in touch, I'd be really keen to hear what you have to say: s.muller@keele.ac.uk.

Reflecting on 'Workplace health and wellbeing: a mixed-methods evaluation of cross-regional workplace health initiatives'

James Yates; Laura Kudrna (University of Birmingham)

Workforce issues were a prominent theme at the ARC Scientific Annual Meeting 2022. There is ongoing research within the ARC on local government health and wellbeing initiatives. We should use this research to launch a new, potentially cross-cutting theme in the next ARC.

Since the CLAHRC, ARC West Midlands have been partnering with Coventry City Council and West Midlands Combined Authority to evaluate the health and wellbeing programmes they deliver to workplaces in their regions. Our previous rapid response evaluation of a monetary incentive to encourage use of their programme showed that while the programme caused employers to take more action by providing information and services, this did not translate to behaviour change or improved health and wellbeing outcomes for employees (publication provisionally accepted in PLOS Global Public Health). These findings suggest that more can be done in the workplace health field to understand how employer actions can translate into a positive outcome for employees.

The team at ARC West Midlands are now working collaboratively with partners in ARC North East and North Cumbria and ARC Northwest London on a new NIHR Prevention Consortium project. The cross-ARC collaboration takes a combined approach to understand why and how health and wellbeing initiatives work at different levels, as shown in Figure 1. Collaborators in North East and North Cumbria are looking at wider context, mechanisms, and implementation processes, while Northwest London are taking an employer and self-care perspective. Here in the West Midlands, we are focussing on employee-level behaviour change.

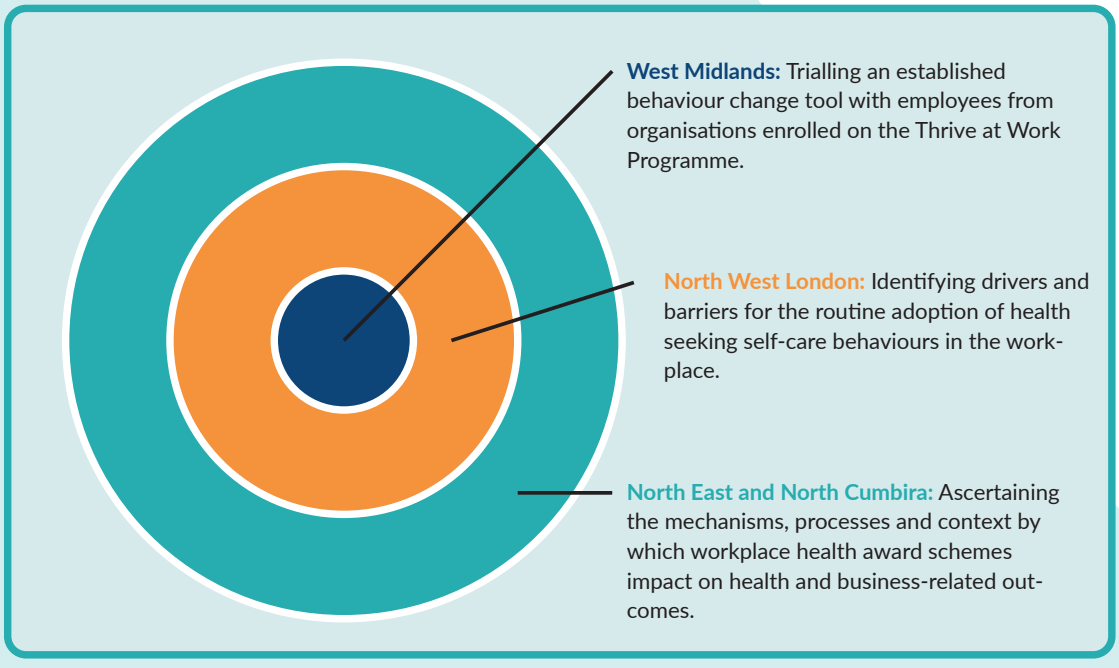

Figure 1: The cross-ARC collaboration to understand why and health and wellbeing initiatives work at different levels

Our behaviour change approach uses an established behaviour change tool called mental contrasting. Research shows that positive thinking alone is not enough to effect change, but that change can be achieved by adding mental capacity. When people indulge in fantasising positively about their future goals, they might experience a warm, satisfying feeling. Unfortunately, this experience can lead to complacency, as well as failure to apply effort and plan for possible hindrances,[1] resulting into these dreams being just that – dreams. In theory, to make these dreams a reality, one must consider the obstacles on the route to this goal. By acknowledging and then planning how to overcome these obstacles, an individual is not only better equipped to navigate these obstacles but is also energised and has more motivation to reach their goals. [Is this what mental contrasting is; creating mental image of how different choices are likely to unfold?]

Systematic reviews show that mental contrasting can impact behaviour change in several settings, including include time management [2] and relationship behaviours in students,[3] physical activity in psychiatric patients,[4] self-care in adults with type 2 diabetes,[5] and high calorie food consumption in the general population. [6] However, these studies were all conducted in health care settings and there have been very few tests of mental contrasting in the workplace. We cannot assume the results will generalise to other settings because healthcare workers have more knowledge of health and wellbeing and may react differently to the intervention. [7] Our research includes a general workplace sample. We sought input from our Patient Public Involvement (PPI) group to co-create the mode of delivery of mental contrasting that would be most effective in a workplace setting. The PPI group also made valuable contributions to our protocol, with recommendations to make our health outcomes measure more specific and include a related behaviour change question. They also reviewed and provided feedback on our recruitment and intervention materials. The coming months will see us commence our trial recruitment – a challenging period in workplace research. Data collection is expected to follow through the autumn months.

Further information can be found on the project here: Workplace health and wellbeing: a mixed-methods evaluation of cross-regional workplace health initiatives - ARC. We welcome any feedback and questions which can be sent to j.yates@bham.ac.uk.

This project is funded as part of the NIHR National Priority Area Research Programme 2020-23 via the 'Prevention including Behavioural Risk Factors' Applied Research Collaboration (ARC) Consortium. The Consortium is led by the NIHR ARC North East and North Cumbria and ARC West Midlands. This project is led by the NIHR ARC West Midlands.

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Reflections on International Scientific Advisory Group Co-funders' Forum

Paul Bird, ARC WM Head of Programme Delivery (Engagement)

The co-funders' forum for ARC West Midlands is a key part of our International Scientific Advisory Group where our health and social care stakeholders join our academics and international advisors for discussion of the challenges in service provision and how research can help address these. It is an event that Richard Lilford as ARC WM Director and I both look forward to, as we are both very 'applied' in our outlook and relish the often messy, complicated problems of service delivery which others might ordinarily choose to avoid. The forum provides a wonderful opportunity for service providers and service users locally to interact with academics of international renown.

This year we were pleased to be able to host our stakeholders in a face to face format, and the good attendance, even allowing for a few inevitable late notice cancellations due to COVID-19, indicated many were pleased to be able to get out and interact in this type of event. We had three really thought-provoking presentations from Prof Helena Teede (Monash University), Prof Tim Hofer (University of Michigan), and Prof Gary Ford (University of Oxford) looking at the challenges of integrating care from differing clinical, academic and national viewpoints. As ever, there were plenty of questions and discussions carried on over dinner in the evening. We had put time aside in our first session the following morning to reflect on some of the points raised and questions asked, and to collate important topics to revisit over the remaining 2.5 years of the ARC WM and for whatever might follow on beyond this. Not necessarily in order, these were:

- Even with the advent of Integrated Care Boards (ICBs), we know that significant silos will remain in service delivery. Acknowledging it is beyond our ability to change these, how can we work alongside the ICBs to best effect?
- We need to work quickly to understand the drivers and levers within ICBs so we can understand how we can align the incentives that research can bring to deliver maximum effect.
- ICBs will take time to mature and whilst the Executive team may present a united approach, it may take time for this vision to percolate through what will be large organisations and systems. We should not therefore assume that ICBs will speak with one voice initially and multi-level engagement is likely to be needed.
- Often one of the key criteria on which we are measured is impact, which comes from implementation and for which we are not funded by NIHR. How do we work with other stakeholders - both service delivery partners in health and social care but also groups such as the Academic Health Science Network to maximise this impact?
- How can we ensure that the research takes place where the implementation is being delivered?
- How can we better involve Public and Patient representatives in the implementation of research?
- Workforce is continually being identified as one of the top areas of concern and risk for providers but what can research do to support this?

- The social determinants of health and addressing inequalities in areas of high deprivation are hugely important for ICBs and they would benefit from our support to tackle these challenges.
- When so much change is likely to be mandated for health and social care organisations, how do we retain a relevancy for research against potentially louder voices for change?

As an organisation we are not big believers in interesting conversations which fail to lead to anything further. Capturing this here gives us a permanent record to revisit, a chance for people to add views they think were missed or points they did not have time to make, and also an opportunity for our blog subscribers who were not in attendance to raise other points. As ever in ARC WM, correspondence is gratefully received!

ARC WM Quiz

Norwegian physician Gerhard Armauer Hansen discovered the causative agent of which infectious disease in 1873?

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

Answer to previous quiz: The 999 emergency telephone number was introduced in the UK on 30 June **1937** and is the world's oldest such service. It was introduced following a house fire in 1935, where a concerned neighbour had been held in a long queue by the telephone exchange. Congratulations to those who answered correctly.

Commercial Evidence of the Limitations of AI in Studying Medical Notes

Richard Lilford, ARC WM Director

Early artificial intelligence (AI) was based on simple Boolean rules. For example, if a pregnant women's previous baby weighed over 4.5kg, then offer a glucose tolerance test or equivalent. But with the increasing success of artificial intelligence, for example in chess and then in the game of Go,[1] there has been a flurry of excitement concerning the use of AI in medicine. There were some early successes, particularly with respect to image analysis,[2] but this was low-hanging fruit. It was soon realised that many medical outcomes are very ambiguous; sepsis for example. People became aware that AI could simply replicate psychological or moral biases prevalent in society.[3] Most difficult of all, is the disorganised and variable nature of the medical record itself.

At first, people thought that it would be possible to get around the problem by defining ontologies. That is to say, all data items of any importance would be classified by the context in which they arise. A great flurry of activity took place and the famous AI program, *Deep Mind*, was conscripted into medical service and fed with routine NHS data.[4]

As careful academic studies revealed, AI does not overcome the problem of scrambled data. Doctors thought that the 'magic' of AI could untangle the non-coded parts of the medical record where the clinical logic unfolds. Data specialists naively thought that these diffuse records could be coded by means of 'ontologies'. Neither side understand the complexity of the problem. Careful studies eventually revealed the underlying difficulty - that something much more laborious than ontologies would be required to 'wrangle' information from the medical record.[5] This will be a long-term undertaking. It should proceed in short steps. We must be patient and accept incremental gains. So excitement waned in the academic world, as reflected in previous articles in your news blog.[6-7] This was mirrored commercially. Deep Mind was first sold to Google in 2014 and more recently the firms AI assistant for doctors, *Streams*, has been discontinued. AI is suddenly not the quick fix that some people thought it would be.

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Evidence-Based Management from the Economist

Richard Lilford, ARC WM Director

The ARC WM Director is a fan of the *Bartleby* column in the Economist newspaper. "Bartleby" uses scientific evidence to inform practice in the office. This topic is highly relevant to ARCs, which are all about management of the services. In the column of 25th June (*print edition*), Bartleby provides evidence that managers are necessary; that good managers produce better outcomes; and that well-intentioned management actions can easily backfire.[1]

First, we need managers. The column cites experimental evidence that groups with leaders perform better than groups without leaders. Teams were randomly assigned to select a leader, or not, before completing a challenging task. Those with a leader were much more than likely than control teams to complete the challenge within a designated time: 63% versus 44%.

Second, good managers elicit much better performance than poor ones. This was tested by tracking the output of workers in a service company who frequently switched between different managers. They observed a systematic difference in output across managers; performance differed by over 12 percentage points across the managers. However, always seeking to improve his performance, the ARC WM Director would be interested to know what behaviors distinguish the best managers.

Third, management action may backfire. ARC WM News Blog readers will remember the study of fining parents who were late in picking up their child from nursery.[2] Perversely, the fine increased the incidence of late parent arrival. The fine was interpreted as a type of payment for keeping the child in nursery. Now a study in Germany has found that financial incentives for good attendance for staff in retail stores lead to a sharp *rise* in absenteeism.[3] Again, payment was seen as providing a license for the behaviour in question; they felt that they had paid for non-attendance by forgoing the attendance payment.

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Using Wearable Technology to Predict COVID-19

Peter Chilton, Research Fellow

Wearable technology, such as smart watches or fertility trackers, are able to feedback to users a variety of health data, such as number of steps taken, heart rate, temperature and sleep patterns. Some can even alert you when there is an issue, for example your heart rate is above a certain BPM or when you have an irregular rhythm. A team of researchers based in Liechtenstein looked into whether the data gathered by such technology could be useful in detecting COVID-19 infections before symptoms presented.[1] This is of particular importance as COVID-19 can be spread prior to symptoms developing, while asymptomatic patients are likely to continue their behaviours assuming they are not infected.

The study utilised a wearable medical device, usually worn to track fertility, provided to 1,163 participants (57% female, mean age 44 years). While the user is asleep, the device measures breaths per minute, heart rate, heart rate variability, wrist skin temperature, skin perfusion, sleep duration and sleep quality. Participants also tracked their behaviours (e.g. use of alcohol, medication, drugs) and any COVID-19 symptoms in a daily diary.

In total 127 participants were diagnosed with COVID-19 during the study (confirmed via molecular/serological assays), of which 66 had regularly worn the device from baseline to onset of symptoms. Participants who tested positive had significantly higher heart rates and wrist skin temperature during the incubation and pre-symptomatic periods, which continued during symptom onset and the recovery period.

The team were able to compare baseline data with that taken during the incubation, pre-symptomatic, symptomatic and recovery periods and use this to train a computer algorithm using a recurrent neural network with long short-term memory cells. This algorithm was then shown to be able to successfully identify 68% of participants infected with COVID-19 two days prior to when their symptoms began.

The authors hope to further train this algorithm, and validate it through a randomised, single-blinded cross-over trial with a planned 20,000 participants.[2]

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The Difference in Safety Standards Between Aviation & Healthcare

Richard Lilford, ARC WM Director

I thank Paul Barach for recently alerting me to the letter that Keith Conradi sent to the Secretary of State for Health and Social Care on his last day as Chief Investigator at the Healthcare Safety Investigation Branch (HSIB).[1]In the letter, Conradi complains of a lack of interest in HSIB investigations from NHS England and from the Department of Health and Social Care. Conradi has a background in aviation and I think misses two points that, had he known them, might have dissuaded him from taking on the job in the first place!

As a general rule (note, this is just my opinion and I have no evidence to back it up), agencies that sit outside the main line of command and that do not have a direct line of influence to the service or a very specific function, are, at best, modestly effective. For example, the National Institute for Health and Care Excellence (NICE) and the Medicines and Healthcare products Regulatory Agency (MHRA) have enduring direct influence, while the Patient Safety Agency proved ephemeral.

But a much bigger problem relates to the whole idea of patient safety. In the aviation industry, safety has a very specific meaning and runs on a largely different channel to dimensions such as the quality of food, baggage handling, and flight scheduling. However, in healthcare, safety lies on the same causal axis as quality and interacts along similar causal pathways with other dimensions, such as access and efficiency. Hiving off safety into a separate category dissociated from quality, is never going to work well. Quality and safety are entangled. Rather than talk about the outcomes of service variables to describe an area of enquiry, it is probably more sensible to talk about the service variables that can influence safety alongside all of the other desirable outcomes of health services. This idea is described more in a previous paper.[2]

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The Cause of a Recent Outbreak of Often Fatal Hepatitis in Children:

Another Example of the Three Hits Hypothesis

Richard Lilford, ARC WM Director

Regular News Blog readers will have encountered the concept of the three hits hypothesis before,[1, 2] where two contemporaneous exposures lead to a disease in genetically sensitive individuals. A classical example is the oral allergy syndrome, where the exposure to a certain type of pollen, combined with eating fruit can lead to itching and swelling of the lips and tongue in genetically predisposed people.[3] Another example is Burkitt's lymphoma, where the combination of cytomegalovirus and malaria leads to lymphoma in predisposed children.[4] I have also previously drawn attention to nodding disease, which shows many of the hallmarks of a three hits disease.[5 ,6]

Another very interesting example has recently been reported.[7, 8] A few months ago, an apparently new type of severe childhood hepatitis was recorded in many countries, including UK. It was soon discovered that this disease was associated with a hitherto benign form of Adenovirus. An extremely interesting case control study carried out at University College Hospital and Glasgow University, shows that a combination of the above Adenovirus and a certain Parvovirus is a trigger for the disease. Further analysis revealed the third hit - genetic changes predisposing to disease. The underlying biology is most interesting. The Parvovirus responsible is unable to replicate, unless certain other viruses are present in the cell. This is because the Parvovirus uses a biochemical mode of action available to it through another viral strain; in this case a specific Adenovirus. Moreover, the genetic mechanism predisposing to clinical disease was not based on a blind search, but rather on a targeted search of genes known to modulate the immune response to infection.

I am sure that clinical colleagues can think of many other examples of the three hits hypothesis.

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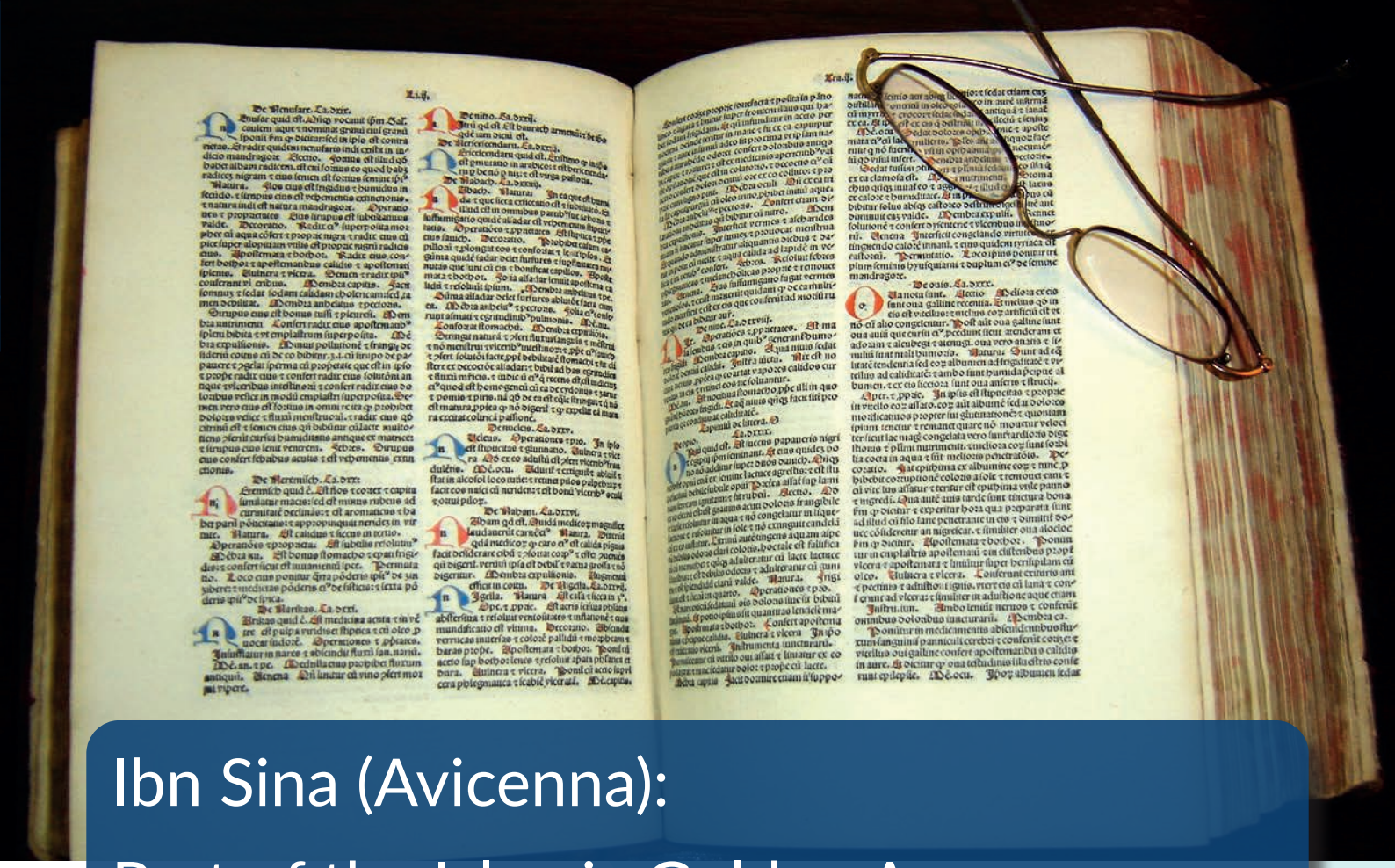

Ibn Sina (Avicenna): Part of the Islamic Golden Age

Philip Simmons, ARC WM Project Administrator

Known in the west as Avicenna, Ibn Sina (*full Arabic name: Abu Ali al-Husayn bin Abdullah ibn al-Hasan bin Ali bin Sīna al-Balkhi al-Bukhari*) was born just outside Bukhara in modern day Uzbekistan, around the year 980 to a minor official. Some say he is the most influential Islamic philosopher and scientist, with around 450 published works on medicine, geometry, astronomy, mathematics and music. Of these, some 250 works have survived, forty of which are medical texts. It is his medical legacy that I will introduce you to.

From an early age Ibn Sina had access to schooling at which he excelled. By the age of ten he had memorised the Quran, and when he was seventeen he was appointed as a physician to Nuh II, the ruler of the Samanid Empire (mostly located in Afghanistan, Iran, Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan, as well as smaller parts of Kazakhstan and Pakistan). Unfortunately, at this time the area was hotly contested by several different medieval states. The Samanid Empire fell, and he fled to Gurganj (North Turkmenistan), which at the time was the capital of another medieval state called Khwarazm. Here he served the ruler of the region before once more leaving court in 1012 due to what his biography described as "necessity". In 1014 Ibn Sina eventually settled in the city of Ray, first serving the ruler Majd al-Dawla as the court physician, before coming under the patronage of his brother Shams-Al-Dawla. This continued until Shams death, at which time Ibn Sina went in to hiding so that he would not have to serve his son Sama` Al-Dawla as vizier. Instead, Ibn Sina hoped to be able to join the ruler of a neighbouring state Ala al-Dawla Muhammad with whom he was in secret contact. Sama` Al-Dawla found out where Ibn Sina was hiding and imprisoned him for four months, until Ala al-Dawla Muhammad deposed Sama al-Dawla and freed Ibn Sina. Ibn Sina became an advisor to Ala al-Dawla Muhammad until his death in 1037 after a severe bout of colic.

Throughout his life Ibn Sina was not only a renowned physician himself, but he came in to contact with some of the finest physicians of his day. He also had access to the greatest libraries containing learnings from the Greco-Roman, Indian, Chinese and Persian worlds. It is a combination of these that helped him create his greatest medical work and one of the most influential works ever "The Canon of Medicine" (al-Qānūn fī al-Ṭibb), a series of five encyclopaedic books completed in 1025.

Why was this important? The Canon was in use until the early 19th century and introduced its readers to the ideas:

- The knowledge that infectious diseases can be contagious and that the spread and impact of this could be limited by quarantine.
- The usage of evidence-based medicine.
- The use of clinical and randomised controlled trials.
- Risk factor analysis in medicine.
- Systematic testing and measuring of results when studying patients.
- The safe, effective and economic use of medicines.
- The use of neuropsychiatry on patients.

Better Use of Data to Improve Patient Care Video

A video looking at *better use of data to improve patient care* has recently been produced with involvement from ARC WM researchers. This follows the publication of their paper in BMJ Quality and Safety on the retrospective evaluation of an intervention based on training sessions to increase the use of control charts in hospitals (Kudrna, et al. BMJ Qual Saf. 2022).

The video is available on YouTube at: https://youtu.be/YkctipI9IEo.

Congratulations

Congratulations to Prof Swaran Singh (Youth Mental Health theme lead) who has recently received a nomination at the APNA NHS Awards, for 'Inspirational cross sector ED&I leader'. The APNA NHS is a network for South Asian heritage NHS leaders to connect, share ideas and provide one another with support.

Congratulations also to Lee Aiyegbusi (Long-term Conditions theme) who has recently been promoted to Senior Research Fellow at the University of Birmingham.

NIHR ARCs Implementation Workshop Series

The implementation leads across the 15 ARCs have organised a series of online workshops to discuss some of the key issues in implementation research and practice:

- 19 Sept: Maximising the impact of NIHR-funded research
- 10 Oct: Bringing organisation science into implementation science (*chaired by Graeme Currie, ARC WM*)
- 14 Nov: Co-production in implementation
- 12 Dec: Capacity building for implementation

All workshops will take place over Zoom, running from 14:00-16:00. For more information, and to register to attend, please visit: https://arc-sl.nihr.ac.uk/node/454.

National NIHR ARC Newsletters - July & August 2022

The July and August issues of the national NIHR ARC newsletter are now available online at: http://eepurl.com/h5DMpb and http://eepurl.com/h6_vKD.

July features news on discrimination faced by NHS staff during COVID; real-time mental health 'thermometers'; impact of gender on cognitive decline; and diabetes risk in people living in urban or rural environments.

Meanwhile, August features details of ARC funding to support early career researchers in dementia; the cost of mental ill health in the North of England; and key methods to calculate life expectancy.

To subscribe to future issues, please visit: https://tinyurl.com/ARCsnewsletter.

Contribution to UK Government COVID-19 Paper

Prof Christian Mallen, Long-Term Conditions theme lead, has recently contributed to a new government paper on the health impacts (both direct and indirect) of COVID-19 in England, which assesses the impacts of the Omicron strain. The full paper is available at: https://www.gov.uk/government/publications/direct-and-indirect-health-impacts-of-covid-19-in-england-emerging-omicron-impacts/direct-and-indirect-health-impacts-of-covid-19-in-england-emerging-omicron-impacts

NIHR Webinar Series

The NIHRtv YouTube channel have produced three 30-minute webinars on leadership. The first '*Leveraging your strengths*' was shown on 9 August, and is still available at: https://youtu.be/Dct8n_qjFDo. The second on '*Leveraging positive power and influence*' will be shown on 6 September, 12:30-13:00 at: https://youtu.be/FjFTG3A1KFY; while the final webinar on '*Encouraging safe conflict*' will be available on 4 October, 12:30-13:00 at: https://youtu.be/rm6zfjO7LLM

Viewers who are able to watch these live will be able to ask questions and receive live responses. Reminders for these upcoming webinars can be set by clicking the '*Notify me*' bell on the page.

NIHR Open Research Launched

Following a successful pilot, NIHR Open Research has now been opened up to all types of NIHR-funded and supported research.

This publishing platform allows NIHR researchers to rapidly publish any research information they wish to share; not only study findings but also incremental findings, case reports and even negative findings, thus supporting the entire life cycle of research.

For more information, and to submit outputs, please visit: https://openresearch.nihr.ac.uk/.

Future-Focused Leadership Programme

The Emerging Research Leaders stream of the NIHR Future-Focused Leadership programme is now open to applications. This is a 12-month programme that incorporates various development opportunities, 360 feedback, action learning sets and individual coaching.

The deadline for online application is 1pm on 16 September 2022. For more information, and to apply, please visit: https://nihr.ac.uk/documents/future-focused-leadership-programme-application-guidance-for-emerging-research-leaders/31065

Harkness Fellowships in US Health Care Policy & Practice

The Commonwealth Fund's **Harkness Fellowships in Health Care Policy and Practice for 2023-24** will provide a unique leadership development opportunity for mid-career research professionals.

Successful applicants will receive funding to spend a year in the United States conducting internationally comparative research with mentorship from leading experts. Fellows will also receive funding to:

- gain an in-depth understanding of the US healthcare system and policy landscape;
- engage in a series of leadership development activities;
- build a robust network for cross-national exchange and collaboration.

Further information can be found at: nihr.ac.uk/funding/harkness-fellowships-in-health-care-policy-and-practice-2022/30789

Recent Publications

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