

ISSN 0041-6193

THE ULSTER MEDICAL JOURNAL

Volume 91 (2) May 2022



The Ulster Medical Journal

The journal of the Ulster Medical Society. First published in 1932.

Successor to the Transactions of the Ulster Medical Society (1862-1929), and the Transactions of the Belfast Clinical and Pathological Society (1854-1860)

Honorary Editor:

Michael Trimble (Belfast, UK)
editor@ums.ac.uk

Honorary Assistant Editors:

Ian Wallace (Belfast, UK), Philip Toner (Belfast, UK)

Section Editors:

Curiositas
Paul Hamilton

Gamechangers
Nicholas Cromie

Letters
Ian Wallace

Journal Club
Philip Toner

Editorial Board:

Mugilan Anandarajan (*Belfast, UK*)
Ian Bickle (*England, UK*)
Barry Clements (*Belfast, UK*)
Janitha Costa (*Belfast, UK*)
Nicholas Cromie (*Belfast, UK*)
Peter Crookes (*Belfast, UK*)
Mark O'Donnell (*Belfast, UK*)
David J Eedy (*Craigavon, UK*)

Gerry Gormley (*Belfast, UK*)
Paul Hamilton (*Belfast, UK*)
Nigel Hart (*Belfast, UK*)
John Hedley-Whyte (*Boston, USA*)
Joe Houghton (*Belfast, UK*)
Andrew McIvor (*Hamilton, Ontario*)
A Peter Maxwell (*Belfast, UK*)
David Mills (*Belfast, UK*)

John E Moore (*Belfast, UK*)
Anthony O'Neill (*Belfast, UK*)
Shanmugasundaram Rajkumar
(*Scotland UK*)
Benjamin Tharian (*Arkansas, USA*)
Eiman Abdel Meguid (*Belfast, UK*)
Pat Croskerry (*Halifax, Nova Scotia*)

Honorary Treasurer: Geraldine Gallagher **Sub Editor:** Mary Crickard **Editorial Assistant:** Kathy Clarke

Statement: The Ulster Medical Journal is an international general medical journal with contributions on all areas of medical and surgical specialties relevant to a general medical readership. It retains a focus on material relevant to the health of the Northern Ireland population.

Disclaimer: The Ulster Medical Journal is owned and published by The Ulster Medical Society, itself founded in 1862 by the amalgamation of the Belfast Medical Society (founded 1806) and the Belfast Clinical and Pathological Society (founded 1853). The owner grants editorial freedom to the Editor of the Ulster Medical Journal. The Ulster Medical Journal follows guidelines on editorial independence produced by the World Association of Medical Editors, and the code of good practice of the Committee On Publication Ethics.

Copyright: UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>). The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

The journal is published in January, May and September, by the Ulster Medical Society, and typeset and printed in the UK by Dorman and Sons Ltd, Belfast. See inside back pages for institutional and personal subscriptions.

Contact Details: All enquiries on submissions, subscriptions, permissions and advertising to the Editorial Office, The Ulster Medical Journal, Whitla Medical Building, 97 Lisburn Road, Belfast BT9 7BL. United Kingdom.

T/F: +44 (0) 28 9097 5780 **E:** umj@qub.ac.uk **W:** <http://www.ums.ac.uk/journal.html>

Editorial

Vocation in medicine

Michael Trimble

Why do you do what you do?

Much has been made of importance of professionalism in medical practice. And, whilst much ink has been spilt on the mechanics of ensuring that medical students develop professional behaviours, less attention has been paid to intrinsic motivation, the answer to the question: Why should I behave in this way?¹ Indeed, professionalism risks being seen as ‘just a game’ to be played.² In older parlance, we used to speak of *profession*, rather than professionalism. Profession referred to the vow of commitment made by those entering the occupations of divinity, law, medicine, and the military. Such profession or commitment extended to the point of risking one’s life: A fact, whilst still obvious in the case of the soldier, is perhaps not usually considered by applicants to medical school. In modern times, in the West at least, medicine was seen as a low-risk endeavour: Until now, until the coronavirus.

The virus has taken its toll on healthcare workers - doctors and nurses. A BBC report early in the course of the pandemic noted the deaths of 163 doctors and 40 nurses in the first wave of coronavirus in Italy.³ and yet we still showed up for work. It is clearly more than a job; more than an occupation to be performed whilst exhibiting professional behaviours; it is, I think, best described as a vocation.

However, vocation is a word that has lost its gloss of late. It is widely used merely to describe any job. Vocational qualifications may be obtained in fields as diverse as travel and tourism, IT, performing arts, and floristry. Clearly the practise of medicine is different to work in these areas. I am therefore suggesting that there is a need to understand and recover the concept of vocation.

Doctors often speak of a having sense of vocation but what do they mean? The word itself has its roots in the Latin *vocare* meaning “to call”. This concept of vocation originates from religious life – describing the sense of feeling called by God to follow a certain path or career. Personally, as a Christian, I understand that sense of calling but what does it mean in today’s more secular age? If one is not called by God, then in what sense may one be said to have a vocation? How can we best define and use the term to help our students and trainees find and understand their ‘calling’ in medicine?

Outside of the spiritual context, Duffy and Dik define calling as “a transcendent summons, experienced as originating beyond the self, to approach a particular life role in a manner orientated toward demonstrating or deriving a sense of

purpose or meaningfulness that hold other-oriented values and goals as primary sources of motivation.”⁴ This distils down into three components: an external summons, meaning/purpose, and prosocial motivation.⁵ Whilst some may experience a sense of summons or destiny, another common feeling is that of work being a ‘perfect fit’ with one’s skills and passions. This may assist us in helping our students and trainees understand their sense of vocation. We cannot generate a sense of external call from a higher agency but we may be able to help them find their calling in the weaker sense of finding their *perfect fit*. This may be good career advice to give students or trainees in normal circumstances but what about when times are hard; when this translates to personal risk for the doctor? Philosopher Nassim Nicholas Taleb describes the importance of having ‘skin in the game’.⁶ For the physician, skin in the game, participation in sharing the risk, is a must. To have skin in the game is only the beginning. Taleb identifies a deeper level of involvement. This is to have ‘soul in the game’ as demonstrated by artisans. “Artisans put some soul into their work: They won’t sell something defective or even of questionable quality, because that would hurt their most deeply felt values.” Artisans “do things for existential reasons first” and have “sacred taboos, things they will not do”. We need to help our students and trainees come to terms with risk and uncertainty in practice. (Though I must say how impressed I have been by the commitment of the trainees in the hospital where I work.) “How much you truly “believe” in something can be manifested only through what you are willing to risk for it.” Understanding the value of having ‘skin in the game’ can help us respond to the challenges of practice. A sense of vocation important for the individual physician at every stage of their professional life. Intrinsic motivation is a factor leading students to apply to medical school,⁷ it influences choice of specialty,⁸ and protects against physician burnout.⁹ It is also important for patients and coheres with compassionate care.¹⁰ Intrinsic motivation is what keeps us at work even when the stakes are high.

And so, whilst *vocation*, severed from its religious roots, has the potential to be misunderstood and neglected it can also embolden and encourage. Indeed, psychologist Daniel Brown notes the combination of proactive perspective, spirituality and motivation as being important factors promoting human thriving.¹¹ You can prosper in medicine as a job or career, you can struggle through the dark times following your profession, but I think to really *thrive* requires a vocation.

1. Trimble M. When I say ... profession. *Med Educ*. 2019;53(10):965-6.
2. Roshni-Pinto-Powell TL. Just a Game: the dangers of quantifying Medical Student Professionalism. *J Gen Int Med*. 2019; 34(8):1641-4
3. Bettiza S. Italy's medical workers: 'We became heroes but they've already forgotten us' [Internet]. London: BBC News Online. 2020 May 26. [cited 2020 May 29]. Available from: <https://www.bbc.co.uk/news/world-europe-52784120>.
4. Dik BJ, Duffy RD. Calling and vocation at work: definitions and prospects for research and practice. *Couns Psychol*. 2009;37(3):424-50
5. Duffy RD, Dik BJ. Research on calling: What have we learned and where are we going? *J Vocat Beh*. 2013;83(3):428-36
6. Taleb NN. *Skin in the Game: hidden asymmetries in daily life*. New York: Random House; 2018
7. McHarg J, Mattick K, Knight LV. Why people apply to medical school: implications for widening participation activities. *Med Educ*. 2007;41(8):815-21
8. Borges NJ, Manuel RS, Duffy RD. Speciality interests and career calling to medicine among first-year medical students. *Perspect Med Educ*. 2013;2(1):14-7.
9. Yoon JD, Daley BM, Curlin FA. The association between a sense of calling and physician well-being: a national study of primary care physicians and psychiatrists. *Acad Psychiatry*. 2017;41(2):167-73.
10. Kristjánsson K, Varghese J, Arthur J, Moller F. Virtuous practice in nursing. Research report. [Internet]. [cited 2022 Mar]. Birmingham: University of Birmingham; 2017. Available from: <https://www.jubileecentre.ac.uk/1588/projects/current-projects/virtuous-practice-in-nursing>.
11. Brown DJ, Arnold R, Fletcher D, Standage M. Human thriving: a conceptual debate and literature review. *Eur Psychol*. 2017;22(3):167-79

Erratum:

RE: Alun Evans, The Belfast Branch of the Socialist Medical Association, *Ulster Med J* 2022;91(1):32-38

Address for correspondence should read:

Alun Evans MD
 Professor Emeritus
 Centre for Public Health
 The Queen's University of Belfast
 Institute of Clinical Science B
 Grosvenor Road
 Belfast BT12 6BJ
 United Kingdom
 Tel: 0044 28 9096 3306



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>). The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Review

The Role of Visual Abstracts in the Dissemination of Medical Research

Beverley C. Millar^{1,2,3} and Michelle Lim⁴

ABSTRACT

Medical research within the UK has continued to grow, most notably during the COVID-19 pandemic over the last two years, which highlights the importance of disseminating relevant research findings. For all researchers involved in clinical trials and scientific research, the end goal of success is not completed following the publication of the research findings, but ultimately true impact and significance is achieved when such research has a role in developing clinical practice. Each year between 2.5 – 3 million scientific papers are published and the number continues to rise, therefore it is becoming increasingly difficult to ensure that published research has such a targeted impact as it must first get noticed. Increasing time commitments result in difficulties for clinicians keeping up-to-date with the current literature and in order to address this, journals and researchers have developed approaches to share peer-reviewed research with the wider research community in an effective and efficient manner. One such approach has been the introduction of the visual abstract which comprises of an infographic style format, coupled with a shortened, limited word summary of the research abstract detailing the key question, methodology, findings and take home message of the research study. The visual abstract has characteristics which enable it to be shared on social media platforms and in turn increase the interest and impact within the research community. Visual abstracts are being increasingly introduced within medical journals and organisations to help disseminate valuable research findings. This review focuses on visual abstracts, what they are, their history, structure and role within research dissemination and medical education.

KEY WORDS

dissemination, medical education, science communication, social media, visual abstract

INTRODUCTION

“If a tree falls in a forest and no one is around to hear it, does it make a sound?”

(Henriksen and Mishra, 2019)¹

The ultimate goal of medical research is to have impact on clinical practice and as reported by the National Institute for Health Research, “clinically research-active hospitals

have better patient care outcomes”.² However, increasing numbers of high quality medical research although published, may never be disseminated, cited or read, other than by the authors, the peer-reviewers and the editor of the accepting journal, thus questioning the significance and value of such research.¹ It is therefore fundamentally important to disseminate research to a wide audience to facilitate and promote the implementation of research findings into clinical practice.¹

The impact of research, particularly in academia, has traditionally been measured quantitatively in terms of number of publications, the impact factors of journals where the research has been published, the number of citations and the *h*-index.³ This form of assessment has been viewed by some as outdated and it has been suggested that the validity of the traditional form of assessment has been compromised due to a number of issues, such as, the increased numbers on author lists, the volume of papers published, self-citations, extensive reference lists and papers published in high impact journals by common groups of authors³. More recently, due to the advancements in digital technology, additional complementary research evaluation, attention and dissemination metrics have been introduced by institutional repositories and journal websites, such as Altmetric⁴ and PlumX Metrics⁵. These metrics aim to provide a more comprehensive indication of the impact of research outputs, within the online environment and complement the traditional bibliometrics.⁶ These additional indices reflect digital footprints and provide a more comprehensive overview of the interest that the published research has had in terms of citations including clinical, patent and policy documents, usage, captures, mentions and social media⁶. Currently, however, traditional citation bibliometrics still remain the

¹School of Medicine, Dentistry and Biomedical Sciences, The Wellcome-Wolfson Institute for Experimental Medicine, Queen’s University, 97 Lisburn Road, Belfast BT9 7BL, Northern Ireland, UK,

²School of Biomedical Sciences, Ulster University, Cromore Road, Coleraine, BT52 1SA

³Northern Ireland Public Health Laboratory, Belfast City Hospital, Lisburn Road, Belfast, Northern Ireland, BT9 7AD, UK.

⁴James Cook University Hospital, Marton Road, Middlesbrough, TS4 3BW, UK

Correspondence to: Professor B. Cherie Millar

E-mail: cherie.millar@qub.ac.uk



most recognised for impact evaluation of peer-reviewed publications and researcher activity within academia.

Irrespective of which bibliometrics are favoured, it is important that for peer-reviewed published research to have educational or clinical impact such research must be first noticed and subsequently read by the appropriate and varied target communities within research, education, government as well as healthcare policy makers and discipline specific groups providing guidelines.

“What information consumes is rather obvious: it consumes the attention of its consumers. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.” (Simon, 1971)⁷

The concept of attention and various aspects of attention have been discussed and researched extensively amongst psychologists for centuries⁸, however with the ever increasing demands on individuals' time, attention is currently globally seen as a valuable commodity which is required to be captured. The term “*attention economy*” was originally devised in 1971 by the psychologist, economist and Nobel Laureate, Herbert Alexander Simon, who believed that an abundance of information would result in the consumption of attention⁷. Attention economy is not only important to organisations and business but also to publishers and authors of clinical and scientific research. Investment must be given to design approaches to capture the attention of readers and other researchers to facilitate the communication of research findings to key stakeholders whether that be service users, multidisciplinary healthcare teams or other researchers, by a variety of dissemination approaches to ensure attention and understanding in a resourceful manner⁹.

It is astonishing with how little reading a doctor can practice medicine, but it is not astonishing how badly he may do it. (Osler, 1904)¹⁰.

It is essential that all clinicians, healthcare staff, researchers and students, can adapt and draw upon the current research knowledge to deliver safe, quality evidence based-practice for patient care and successful outcomes¹¹. Developments within medicine are constantly and rapidly evolving and it is common practice to consult clinical journals to keep informed of recent research and reflect on such literature, which could impact or change clinical practice. Reviewing and reflecting on current medical literature, not only in relation to specific speciality disciplines, but in general terms, contributes to personal learning and continuing professional development in terms of keeping knowledge skills up-to-date, as well as identifying centres of excellence which could potentially be sources of clinical guidance in the future^{11,12}. Importantly, the construction of clinical practice guidelines is built upon a solid evidence-base by systematic review of the published literature.¹³ It has been calculated that the growth in publication outputs from scientific research in the field

of Life Sciences has an annual growth rate of 5.07% and a doubling time of 14 years¹⁴. The time required to navigate through the oceans of articles published each month, filter and subsequently read, result in individuals facing challenges of how to allocate their time to focus on the articles which are significant in terms of their personal interests and those whose findings could impact on their clinical practice. As such, recently a variety of strategies have been documented to keep abreast with such medical literature through journal surveillance, manuscript review, rounds/seminars, amongst other approaches¹¹.

‘With half an hour’s reading in bed every night as a steady practice, the busiest man can get a fair education before the plasma sets in the periganglionic spaces of his grey cortex’ (Osler, 1909)¹⁵.

Visual abstracts are a communication approach increasingly being used by authors and journals to stimulate selective attention and disseminate research findings to a broad audience both within and outside the readership of a particular journal in a concise manner and shared via social media.¹⁶ Such image-focused summaries provide clinicians and researchers with a snapshot of current research findings and help guide which articles to select for further in-depth examination, whether for educational or research purposes. Visual abstracts, what they are, their history, role and structure are discussed in this article to complement their introduction within the *Ulster Medical Journal*.

THE PURPOSE OF VISUAL ABSTRACTS

“Visualisation lays the foundation of new modes of thought and dissemination of scientific ideas and information” (Ostergren, 2013)¹⁷

Visualisation of key research outcomes offers the advantage of using a common language, thereby permitting global dissemination in a format which is accessible and understandable.^{17,18} Such visual representations not only improve memorability in comparison to verbal representation but also help to persuade the viewer to examine the research in greater depth by retrieving the article.^{17,18} The routine use of visualisation to communicate research findings not only allows scientists to develop competency in relation to visual literacy skills but more importantly, leads to the enhancement of cognition by means of visual thinking.^{17,18}

Nearly six years ago, Professor Andrew Ibrahim, Creative Director of *Annals of Surgery*, wished to improve how researchers could disseminate their research findings visually and the result was the introduction and sharing by the journal of the first visual abstract in July 2016 via social media using the hashtag #VisualAbstract.¹⁹ The concept of visual representations of scientific research findings was not novel as many journals since the 1980s have used other visual formats such as central illustrations and graphic summaries to convey such information. Central illustrations and graphic summaries are used to convey the primary message



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

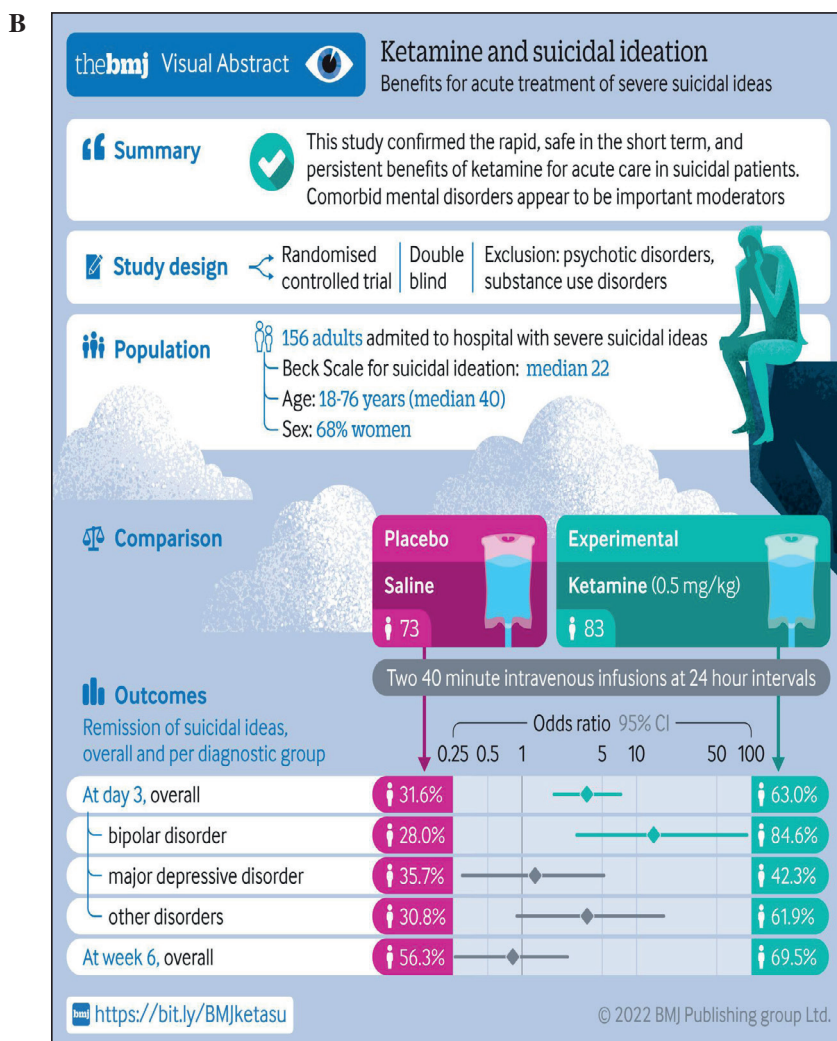
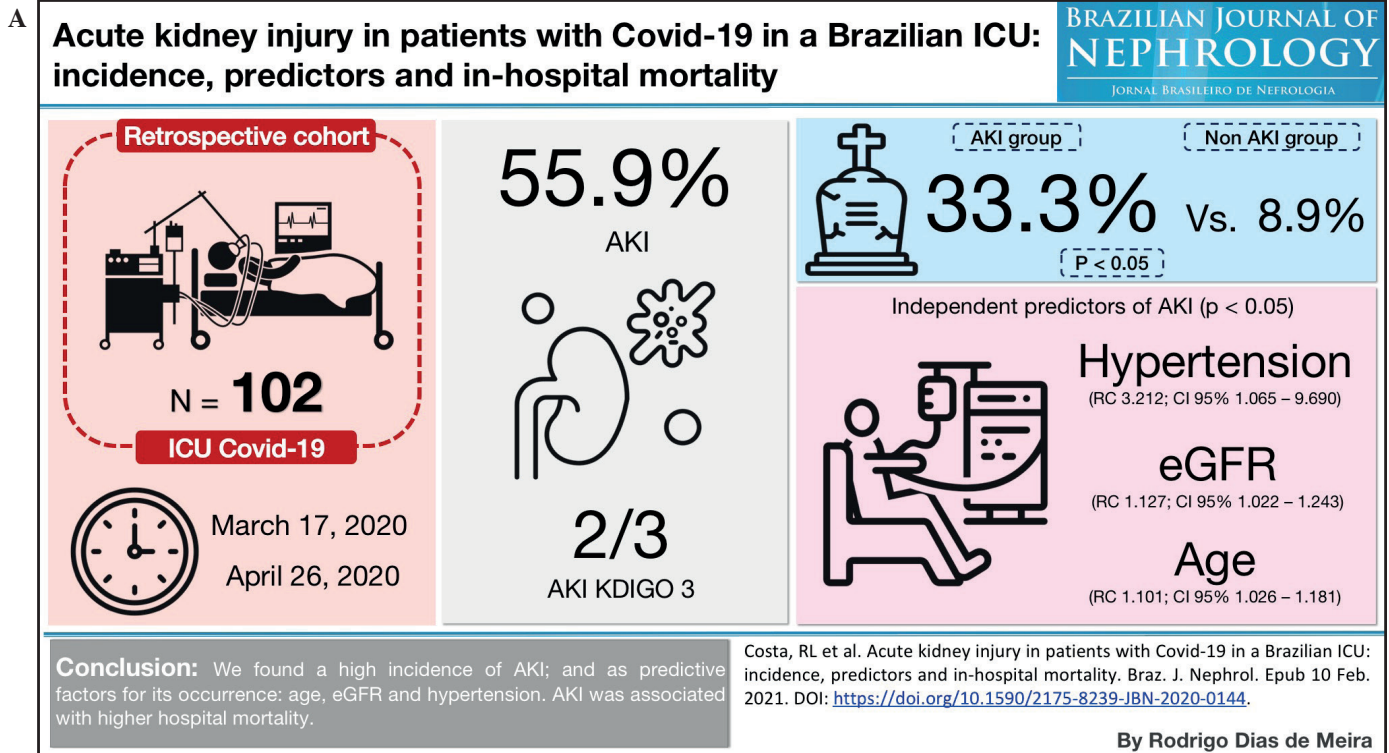
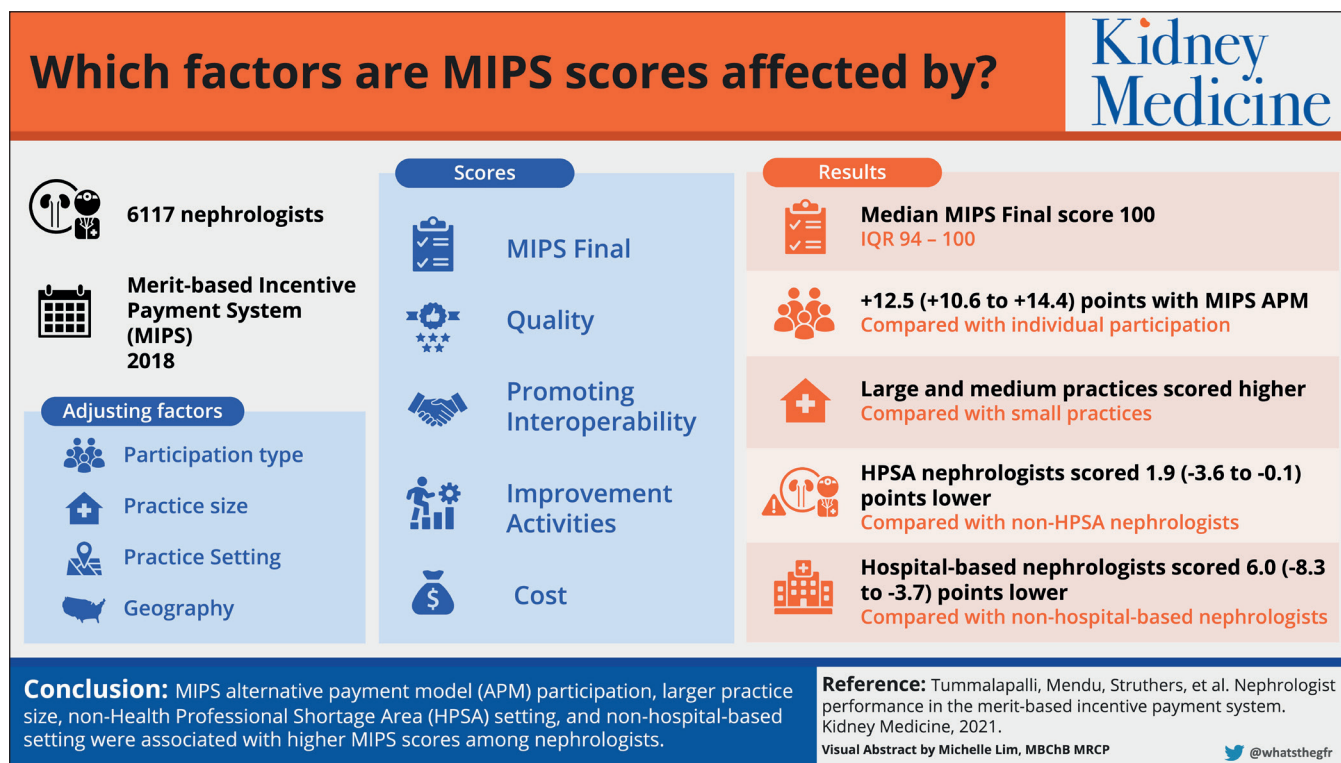


Figure 1: Examples of visual abstracts used in the peer-reviewed published literature.

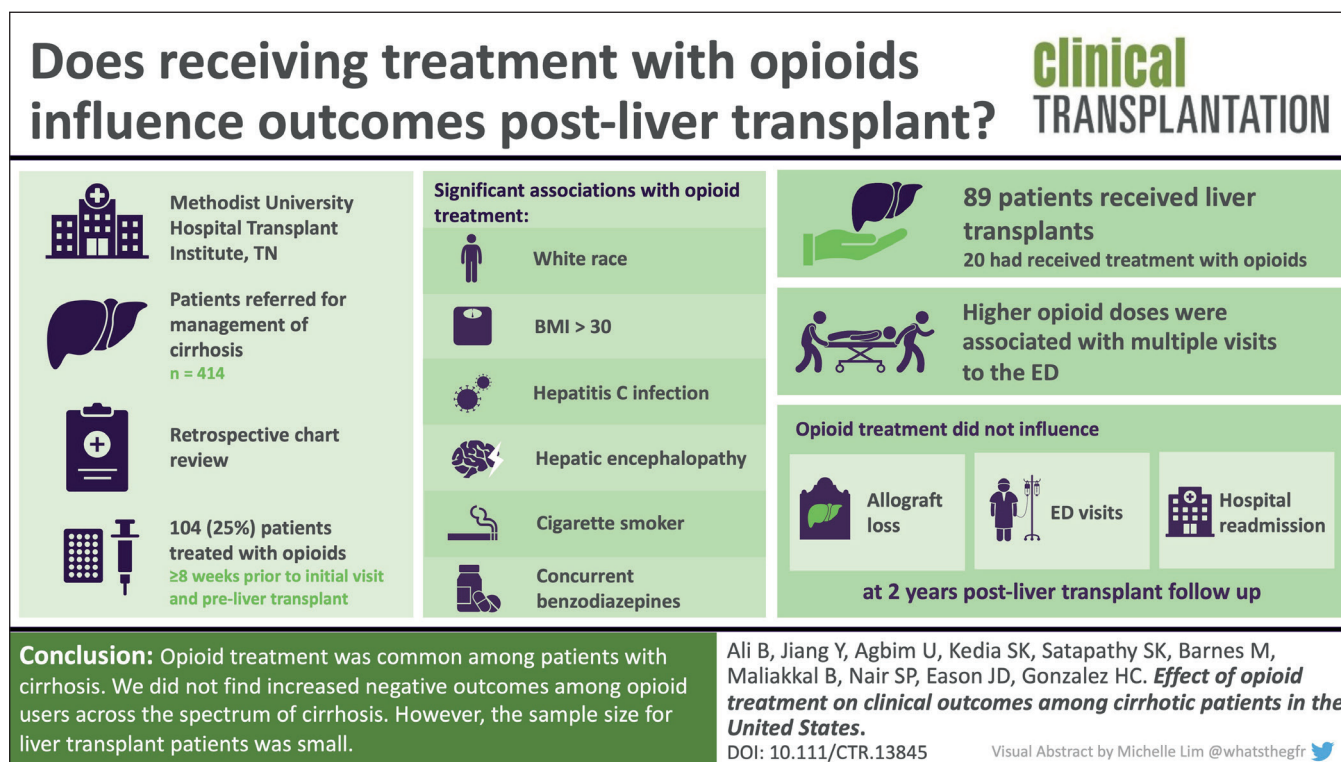
- (A) Taken from Costa RLD, Sória TC, Salles EF, Gerech AV, Corvisier MF, Menezes MAM, et al. Acute kidney injury in patients with Covid-19 in a Brazilian ICU: incidence, predictors and in-hospital mortality. *J Bras Nefrol.* 2022;43(3):349-358, under a Creative Commons Attribution (CC BY) License. (<https://creativecommons.org/licenses/by/4.0/deed.en>).²⁴
- (B) Taken from Abbar M, Demattei C, El-Hage W, Llorca PM, Samalin L, Demaricourt P, et al. Ketamine for the acute treatment of severe suicidal ideation: double blind, randomised placebo controlled trial. *BMJ.* 2022 Feb 2;376:e067194, under a Creative Commons Attribution-Non-Commercial (CC BY-NC 4.0) License (<http://creativecommons.org/licenses/by-nc/4.0/>).²⁵

C



(C) Taken from Tummalapalli SL, Mendu ML, Struthers SA, White DL, Bieber SD, Weiner DE, et al. Nephrologist Performance in the Merit-Based Incentive Payment System. *Kidney Med*. 2021;3(5):816-826.e1, under a Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) License. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).²⁶

D



(D) Visual Abstract used in conjunction with the full article by Ali B, Jiang Y, Agbim U, Kedia SK, Satapathy SK, Barnes M, et al. Effect of opioid treatment on clinical outcomes among cirrhotic patients in the United States. *Clin Transplant*. 2020;34(6):e13845.²⁷



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

or the most important findings detailed in a paper by means of a single illustration or graphical image. Unlike visual abstracts, they do not contain any details on methodology and generally appear at the end of the paper or at the end of the results section, the beginning of the discussion or as a thumbnail linked to the article.²⁰ In contrast, a visual abstract is generally presented at the beginning of the article after the scientific abstract. The purpose of the unique layout of the visual abstract is to provide a visual summary of research studies using visual icons in a format where scientific abstract meets infographic. Historically visual abstracts have used single or dual coloured icons and a limited text to convey the main outcomes of studies accompanied with a citation to the full article and credit to the visual abstract constructor.²¹ The purposes of the visual abstracts are multi-fold namely to (i) assist readers scan recent research articles to acquire a flavour and comprehension for what is new and current in clinical research, (ii) engage and entice the reader to retrieve and read complete articles, which is fundamentally important prior to changing or influencing decisions relating to clinical practice^{19,21}, (iii) promote a deeper engagement and discussion regarding the study findings²¹, (iv) help facilitate the establishment of scientific communities²², (v) increase a broader readership and (vi) provide a preview output which lends itself to dissemination particularly via social media. Since 2016, over one hundred medical journals and organisations, initially many nephrology and surgical journals and subsequently other various specialisms, including, but not limited to, the *New England Journal of Medicine*, *The British Medical Journal*, *Stroke*, *Academic Psychiatry*, *Medical Education* and *JAMA Open*, have adopted visual abstract formats, with several journals including *Bone and Joint Research* and the *British Journal of Sports Medicine*, dedicating sections to this aspect.²³ Some examples of the varied visual abstract designs are shown in Figure 1.

RESOURCES AND SKILLS TO PREPARE A VISUAL ABSTRACT

There is much variation in the style and structure of visual abstracts currently shared on social media and as such, journals have provided guidelines to help standardise these outputs based on current published evidence to ensure

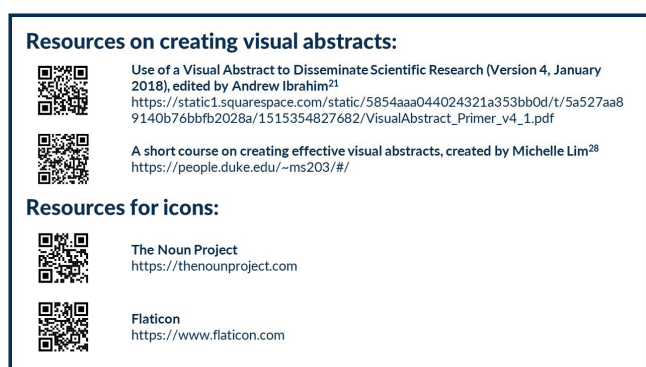


Figure 3: Key resources relating to the preparation of visual abstracts

Figure 2: The top ten tips for preparing an effective visual abstract

Ten tips for creating an effective visual abstract		
	Content Prioritise the content included in the text abstract as this is what the authors have deemed most important.	1
	The title Frame this as the question the study has set out to answer. This will give your visual abstract a context and focus.	2
	Consider the flow of information Ensure that your readers are clearly oriented and directed to follow the flow of information on your visual abstract.	3
	Font Stick to one font family and do not use decorative fonts. Avoid underlining as this can be mistaken for hyperlinks.	4
	Icons Depict information graphically and avoid copying and pasting graphs and charts from the article which will cause clutter.	5
	Space and alignment Ensure that spacing and alignment are uniform by using inbuilt rulers. Be minimalistic and avoid clutter.	6
	Diversity and inclusivity Use gender-neutral icons where possible and avoid icons that stereotype or have religious or political connotations	7
	Attribution and copyright Include a full reference, Twitter handles (@) and hashtags (#) of the authors and institutions. Attribute icons appropriately.	8
	Feedback Seek feedback from multiple sources (with and without relevant expertise) to ensure clarity and accessibility.	9
	Final checks Run a spellcheck and ensure that your visual abstract is clearly legible on screens of different sizes.	10

consistency and validity of the visual abstracts associated with their journal. There are three main valuable resources which help guide in the construction of a visual abstract and which have been consulted when designing the templates for use in the *Ulster Medical Journal*, namely (i) Visual Abstract Primer (edited by Andrew Ibrahim)²¹ which covers topics such as creating a visual abstract and leveraging a visual abstract for dissemination, (ii) Andrew Ibrahim's Guidelines to Standardise Visual Abstracts for Scientific Research¹⁹ and (iii) Michelle Lim's short course on designing and the design process of visual abstracts.²⁸ The guidance detailed below and in Figure 2 and Figure 3 has been taken from these three resources.

In order to prepare an effective and informative visual abstract, it is not essential to use costly and complicated illustrative software or to possess extensive artistic or graphic design skills. It is important however, to be able to condense information and represent such information logically and coherently into three main sections encompassing the methodology, the main findings and conclusions of the research study. Additional skills which are required include creativity in thought of how to represent these findings using visual icons and the ability to organise information into bite size sections.²⁸

VISUAL ABSTRACT STRUCTURE

PowerPoint is the preferred digital tool to construct visual abstracts and used extensively by numerous journals and as such, the *UMJ* have prepared PowerPoint templates which will be used when visual abstracts accompany clinical papers. All template formats consist of four main areas as detailed below and examples of visual abstracts relating to previous articles published in the *UMJ* are shown alongside their paired scientific abstract, which is the primary source of the most important content prioritised in the visual abstract (Figures 4-6). Details relating to the four areas of the visual abstract are detailed below and general guidelines are provided in Figure 2.

Central to the construction of a visual abstract which is aesthetically pleasing and which contributes to promoting attention and further cognitive pursuit, is to ensure that its individual elements are discernible and there is a clear relationship between these sections with a logical flow.^{17,18} Research has suggested several key tips to ensure that there is a minimum pressure on the working memory namely by minimising clutter, avoidance of prolixity and information overload and ensuring that images and text are germane to the key messages which need to be conveyed.¹⁸

4a WRITTEN ABSTRACT

Introduction

Prophylactic antibiotics have been shown to reduce the rate of surgical site infection (SSI), however there is little evidence supporting the effectiveness of one antibiotic over another. We have studied SSI rates and antibiotic prophylaxis protocols in Northern Ireland trauma surgery over a 10-year period to identify the most effective antibiotic protocol associated with lowest rate of SSI.

Method

Antibiotic prophylaxis protocols from 2004-2014 were sought from each of the region's 4 trauma hospitals and their dates of introduction recorded. For the same period, the number of trauma procedures carried out quarterly and the number of SSIs were recorded for each hospital from the return of prospectively collected SSI surveillance forms.

Results

26849 trauma procedures were included with an overall SSI rate of 1.34% (95% Confidence interval [CI] 1.21 to 1.49). Single dose flucloxacillin (2 grams) with single dose gentamicin (3mg/kg) was the most commonly used protocol used in 3 different hospitals for a combined 13.5 years covering 11445 procedures. The SSI rate was 0.72% (95% CI 0.58-0.89). Triple dose cefuroxime (1.5 grams) was used in 2 different hospitals for a combined 10 years covering 8864 procedures. The SSI rate for this regime was 2.46% (95% CI 2.16-2.80). Single dose cefuroxime (1.5 grams) was used in 2 different hospitals for a combined 8 years covering 6540 procedures. The SSI rate was 0.92% (95% CI 0.71-1.18).

Conclusion

In this prospective observational cohort study prophylaxis using flucloxacillin and gentamicin was associated with the lowest SSI rate. Single dose cefuroxime was associated with a lower rate of SSI compared to triple dose ($p < 0.001$). Identification of antibiotic regimes associated with the lowest SSI rates will promote the judicious use of antibiotics, improve antibiotic stewardship while allowing for continued benefit in the prevention of SSI in an era of ever-increasing antibiotic resistance.

4b VISUAL ABSTRACT

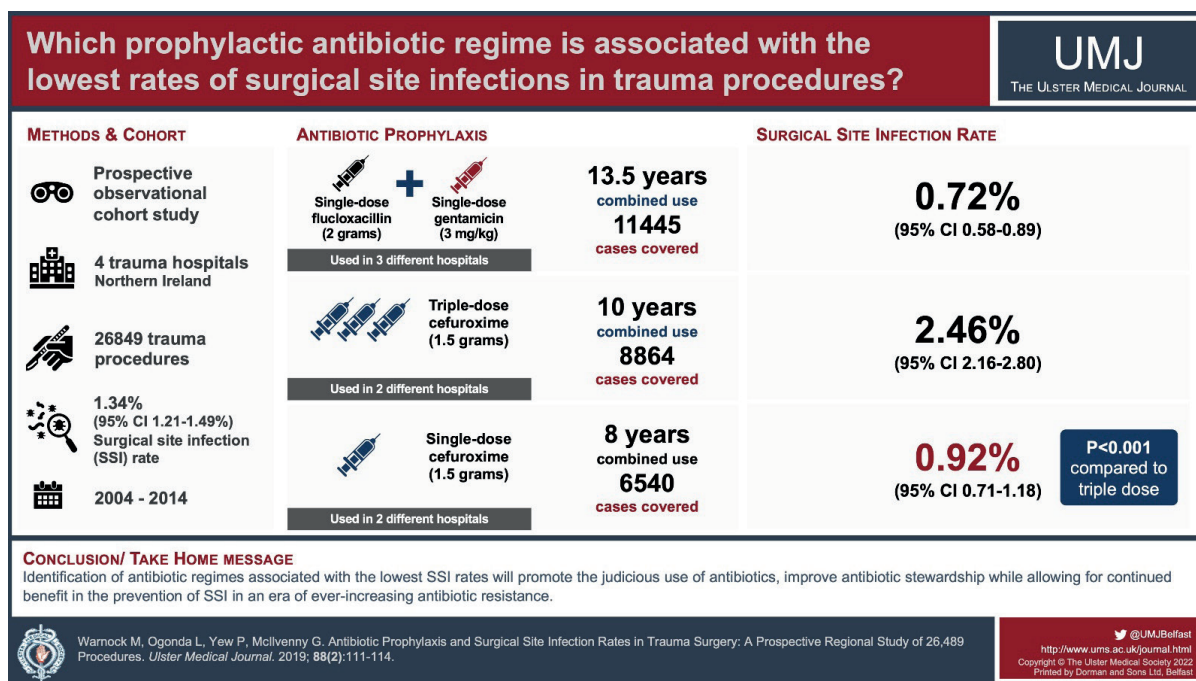


Figure 4: Paired (a) written abstract and (b) visual abstract of a clinical paper previously published in the *Ulster Medical Journal* entitled "Antibiotic Prophylaxis Protocols and Surgical Site Infection Rates in Trauma Surgery".²⁹



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>). The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

5a WRITTEN ABSTRACT**Background**

The delivery of cataract surgery during the COVID-19 pandemic is challenging because of the risk of nosocomial SARS-CoV-2 infection when patients attend hospital for elective care. In order to ascertain the risk to patients awaiting cataract surgery, this study aimed to identify the presence of systemic comorbidities that are associated with a high risk of severe disease or death due to COVID-19.

Methods

A prospective study of 315 patients (630 eyes) was conducted from 3rd June to 31st July 2020. An electronic health record was used to identify any systemic comorbidities that would render a patient 'clinically extremely vulnerable' to COVID-19, as outlined by the Department of Health for Northern Ireland. Patient demographics, best-corrected visual acuity (VA) and risk of postoperative anisometropia were also recorded.

Results

The median age of patients awaiting cataract surgery was 76 years (range 22-97). Of the 315 patients, 72% were aged over 70 and 16% were aged over 85. A systemic comorbidity that would confer high risk status was identified in 21% of patients. This high risk status was attributable to severe respiratory disease, cancer, and immunosuppression therapies in the majority of cases. The high risk group were younger than those deemed non-high risk, but there were no significant differences with respect to gender, anticipated degree of surgical difficulty, VA, or whether the patient was undergoing first or second eye surgery. Of those patients awaiting first eye cataract surgery, the mean VA in the listed eye was 0.84 logMAR and 39% (70/179) had a VA <0.3 logMAR (6/12 Snellen acuity) in their fellow eye. 57% of patients were awaiting first eye surgery, and 32% of those patients would be at risk of symptomatic anisometropia postoperatively.

Conclusion

One-fifth of patients awaiting cataract surgery were found to be at high risk of severe disease or death from COVID-19 and these patients may experience delays in their surgical care. Additional planning is required in order to minimise the morbidity associated with delayed cataract surgery.

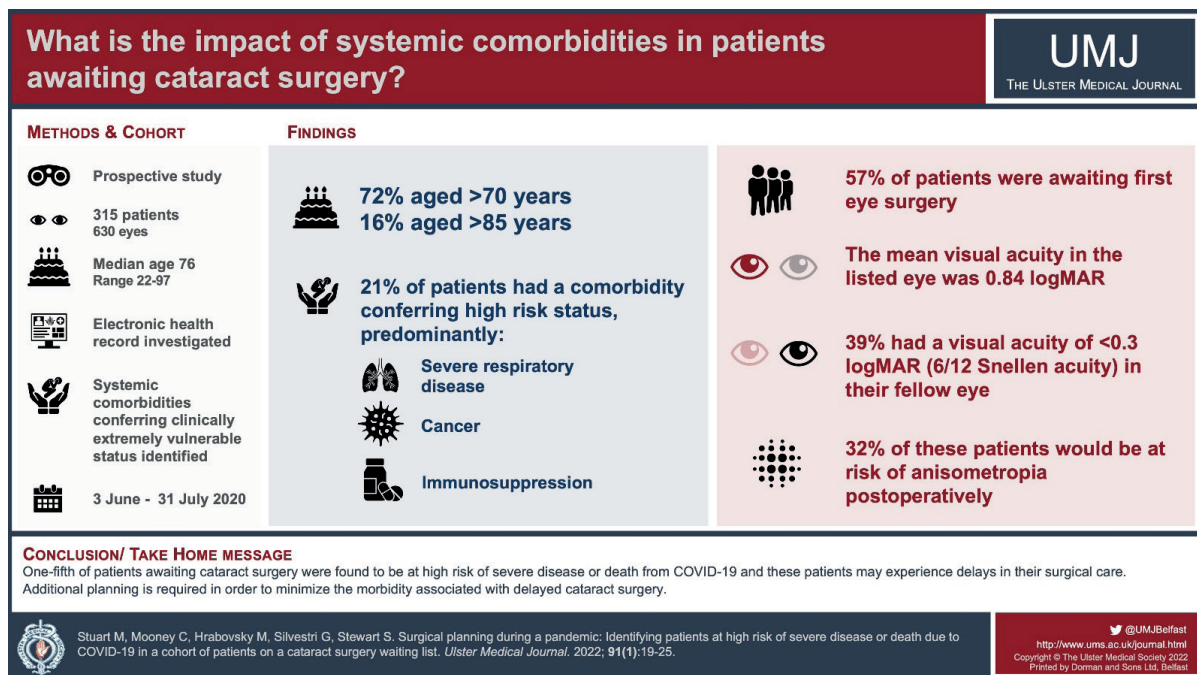
5b VISUAL ABSTRACT

Figure 5: Paired (a) written abstract and (b) visual abstract of a clinical paper previously published in the Ulster Medical Journal entitled “Surgical planning during a pandemic: Identifying patients at high risk of severe disease or death due to COVID-19 in a cohort of patients on a cataract surgery waiting list”.³⁰

6a WRITTEN ABSTRACT

Aim

This project aimed to evaluate the role of ultrasound scan (USS) in children presenting with acute onset right iliac fossa (RIF) pain and suspected appendicitis

Methods

We retrospectively studied 100 consecutive children undergoing USS for RIF pain. Children with low to moderate clinical probability of appendicitis were seen by the surgical team and subsequently underwent USS by a radiologist or a sonographer with a special interest in paediatric USS. The clinical findings, blood tests, and radiological diagnosis led to a decision to operate, observe or discharge. USS findings were subsequently verified with the final histology. The six- month follow-up data of these patients were also analysed.

Results

35 males, median age of 11 years (range 4-17), and 65 females, median age of 14 years (range 6-18) were included. A total of 23 appendicectomies were performed. On histology appendicitis was confirmed in 20, including 16 pre-operatively diagnosed on USS. 6 of these appendicectomies were performed on clinical suspicion with normal USS. 1 patient was diagnosed with neuroendocrine tumour of the appendix. Only 2 negative appendicectomies were performed. 62 patients were discharged without intervention. USS sensitivity was 74%, and specificity was 92% for appendicitis. An additional 16 patients were identified with alternate pathology including 5 ovarian cysts.

Conclusion

Appendicitis was more common in male patients; however, there was no difference in overall disease prevalence in male or female paediatric patients. Thus, USS is a valuable tool to exclude appendicitis in children with low to moderate probability.

6a VISUAL ABSTRACT

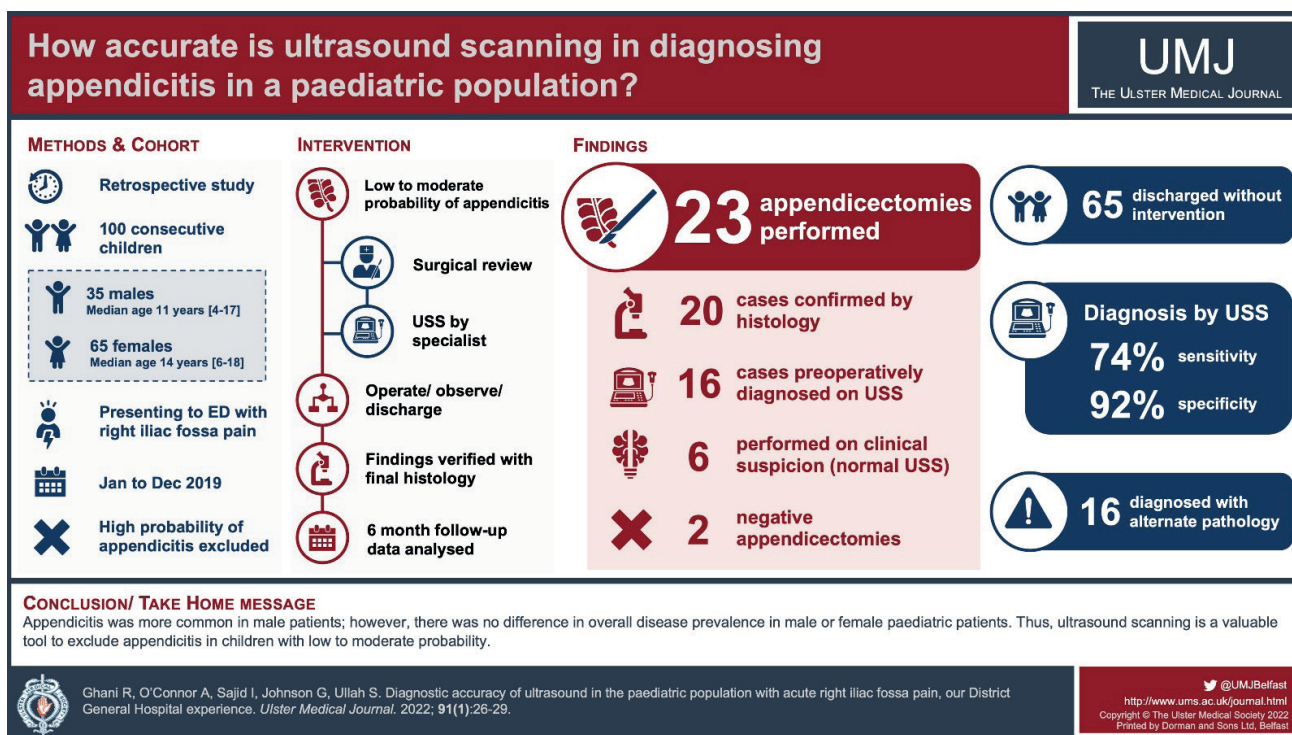


Figure 6: Paired (a) written abstract and (b) visual abstract of a clinical paper previously published in the Ulster Medical Journal entitled “Diagnostic accuracy of ultrasound in the paediatric population with acute right iliac fossa pain, our District General Hospital experience”.³¹

AREA 1: TITLE

In order to gain the readers' initial attention and provide a clear context for the research study, it is recommended that the title should be framed as a question, rather than the same title of the original article. In other words, what question did the study set out to address?

AREA 2: METHODS & COHORT

To ensure that the quality of the evidence, the research design should be described e.g., randomised controlled trial, retrospective cohort study, *in vitro* study, etc., and the time frame and any follow-up periods should be stated.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

AREA 3: FINDINGS

The findings or outcomes of studies are varied and as such it is difficult to definitively state how this section should be formatted. It is important to think of the findings as discrete points and in the case of most studies, short comparative phrases can be included in text box headings, relating to each end point evaluated. Numeric values should be provided for each of the findings detailed including units and values relating to statistical significance, as this will not only highlight the validity of the research findings but also allow readers to interpret the findings themselves.

AREA 4: CONCLUSION/TAKE HOME MESSAGE

It is important that the conclusion aligns with the question in the title and the key take home message the authors wish to convey. Although the original article may have numerous outcomes, it is important to select between one to three main take home messages. Stating numerous outcomes may distract from the key message which the authors wish to convey. It is important, that the primary outcome of the study is presented to minimise reporting conclusions which are not intentionally or non-intentionally biased.

On a cautionary note, although the primary aim of a visual abstract is to present research findings clearly in a simplified manner, if over simplified the outcomes could be potentially misleading with respect to the strength and significance of the study. Furthermore, due to space limitations, authors may only focus on the positive outcomes of the study and overlook findings which were not significant, inconclusive or negative. The visual abstract should be a true reflection of the manuscript content and that they are not used to promote authors' own biases or self-promotion which in turn could impact on research groups' credibility.¹⁷ It is therefore important that where visual abstracts are a formal adjuvant published alongside the peer-reviewed article, that they are included in the peer-review process to ensure validity and quality, prior to the dissemination.

THE PREPARATION OF ICONS

Icons, are graphical interphases which have meaning and have the ability to rapidly convey information which can be remembered effortlessly.³² Icons, are a central to the preparation of an engaging and successful visual abstract as they have the potential to draw the attention of the reader and in turn enhance their understanding and visual learning of the content displayed.³² Studies involving eye trackers to measure visual attention and subjective evaluations have shown that the composition of icons and backgrounds have an effect on user's attention to the viewed icons with solid single colour icons composed of planes resulting in greater fixation, in terms of duration and frequency, as well as subjective evaluation of attention compared to line-based icons, which appear as outlined figures.³² It is therefore recommended that solid fill icons are the preferred format of icons used in visual abstracts. When choosing icons the use of 2-D icons is advised for clarity as 3-D icons may distract the reader

and clutter the visual abstract. Where possible chose .svg or .emf formats as these can be re-coloured in packages such as PowerPoint.

As a rule of thumb, one icon should be used to illustrate one key point. Icons used should be free of copyright restrictions and negate the requirement for attribution and such sources which are freely available include PowerPoint and Pixabay (<https://pixabay.com/>). The Noun Project (<https://thenounproject.com/>) offers an extensive catalogue of over two million icons, however the use of icons without attribution requires a small yearly payment, although educator and student licences are available with a discount. Flaticon (<https://www.flaticon.com/>) is a valuable resource for coloured icons which is free to use with attribution and without attribution with associated costs.

DISSEMINATION OF VISUAL ABSTRACTS

Visual abstracts have a propensity to be shared and disseminated using social media platforms such as Twitter, Facebook, LinkedIn and Research Gate and in turn encourage the full articles to be downloaded.³³ Twitter as of the January 2022 has 396.5 million users with 206 million daily active users.³⁴ This social media platform permits the "tagging" of organisations, fellow researchers and educators, who may be interested in the research topic and tweets or posts encompassing visual abstracts which have been advocated to encourage engagement with the research studies. The twitter platform has been described as shifting the dissemination of research from a "pull" model i.e., requiring individuals to search for research articles themselves to a "push model" which translates to researchers actively transmitting information in a more direct approach to potentially interested audiences.³⁵ A recent article in the Journal of Urology which has published visual abstracts since 2016, reported visual abstract tweets significantly improved overall reader engagement by 65%, compared to tweets without visual abstracts.³⁶ This finding highlights the potential positive impact that the sharing of visual abstracts via Twitter may have in terms of subsequent citations, as it has been previously concluded from a systematic review, on the use of Twitter by medical journals, that using such social media communication improves citation based and alternative bibliometrics for academic medical journals when used in combination with strategies such as tweeting titles, links to articles, infographics or podcasts.³⁷ *The Journal of the American Geriatrics Society* has also examined the dissemination of research articles via social media and compared standard tweets correlating to published articles with tweets that also contained a visual abstract. Interestingly, the standard tweet received 24,984 impressions (i.e. times content was displayed) and 17 tweets (posts) and 36 likes over a period of eight days, whereas the visual abstract tweet received 168,447 impressions, 81 tweets and 100 likes over four days, highlighting a wider interest.³⁸ Numerous other studies have reported a similar significant greater research dissemination, social media engagement and clicks on links to the full articles, particularly by healthcare professionals, further emphasising the need for open access

journals to capitalise on this increase in footfall.^{16,39,40} These findings highlight the potential that visual abstracts have in disseminating research when used in conjunction with social media and the impact that this communication combination approach has on audience engagement, the alternative bibliometrics relating to impact of research publications as well as academic citation.^{38,41}

OTHER USES OF VISUAL ABSTRACTS WITHIN MEDICINE

Education, Journal Clubs, Scientific Conferences

Social media as a platform for electronic communication within medical education has been thrust into the use of alternative approaches to aid in building educational online communities during the COVID-19 pandemic.⁴² Such digital sharing of education information, including visual abstracts has provided valuable approaches to increase the reach of research articles within disciplines as recently reported in surgical education.⁴³

The use of visual abstracts in conjunction with social media has not been limited to their formal publication alongside the full journal article. As healthcare professionals have indicated that they have a preference for visual infographic formats rather than conventional written abstracts when communicating via social media and when viewing online journals,⁴⁴ it is not surprising that visual abstracts have been used as educational tools within journal clubs and

rounds. Presenting and sharing visual infographics has been shown to engage and enhance understanding as assessed by comprehension and recall when used in a weekly orthopaedic journal club.⁴⁵⁻⁴⁷ Medical Schools have promoted the use of visual abstracts in education programmes to share and showcase educational innovation and scholarship by means of a visual abstract poster format thereby permitting presenters to have more time to engage in interactive discussion with interested individuals.⁴⁸

Conferences have used visual abstracts to convey the current research has highlighted by The World Congress of Nephrology (WCN) which is an annual scientific, educational, and networking meeting of the International Society of Nephrology.⁴⁹ Recently the 2021 The Developing Excellence in Medical Education Conference (DEMEC) offered two mechanisms for authors to present their posters on a virtual platform either in the form of a visual abstract or a pre-recorded translational talk about their abstract in a “pitch” format.⁵⁰

Live visual abstracts coupled with tweeting have started to trend at conferences to promote the central messages from presentations freely to a wider audience. Such live visual abstracts have the potential to increase the visibility of the conference as well as the presenters and their research.⁵¹

Key guidance for those who wish to use visual abstracts in this manner has been prepared within the Visual Abstract Primer (edited by Andrew Ibrahim).⁵¹ The use of visual;

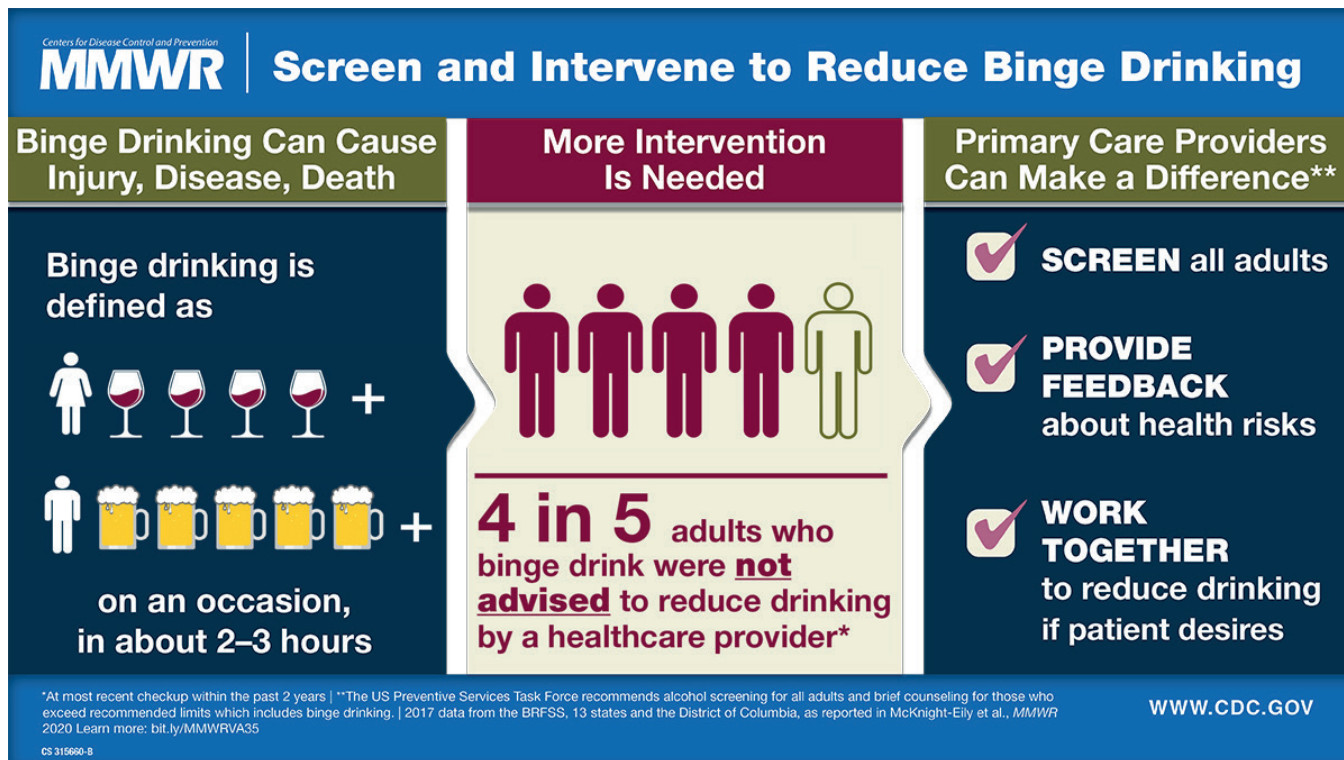


Figure 7: An example of a visual abstract for the lay community published by the Centers for Disease Control and Prevention journal in relation to the published article by McKnight-Eily LR, Okoro CA, Turay K, Acero C, Hungerford D. Screening for Alcohol Use and Brief Counseling of Adults - 13 States and the District of Columbia, 2017. *MMWR Morb Mortal Wkly Rep.* 2020 Mar 13;69(10):265-270.^{53,54}



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

abstracts were examined during an annual conference of Association of Vascular Access & Interventional Renal Physicians (AVATAR 2018).⁵² The findings of this study indicated that such live visual abstracts tweeted using the handle #LiveVisualAbstract received significantly more impressions and engagements than other popular media tweets which covered the same session.⁵² This highlights the potential that this approach can have on delivering information to a wide audience to encourage discussion online and enhancing medical education.

Visual abstracts have been predominantly constructed for and shared with the scientific research community, however more recently, a similar visual abstract format has been used to raise public, policy makers, news and media outlets awareness of important research findings. One such example is the Centers for Disease Control and Prevention journal, *The Morbidity and Mortality Week Report (MMWR)*, which publishes current research related to important public health issues.⁵³ Such visual abstracts are more akin to lay or plain language summaries and although not the focus of this review may offer an informative visual communication route between patients and healthcare providers (Figure 7).

CONCLUSIONS

We live in a society where communication and information rely on embedded visual imagery. As researchers, the communicative power of visual abstracts, particularly when used in conjunction with social media, should be harnessed to disseminate research findings. Although not a replacement for the full article, visual abstracts act as a “taster” to entice a wide audience to examine, retrieve and read the full article in greater depth. Visual abstracts may be used to highlight current research findings and promote individual researchers and research groups through a variety of mechanisms. The primary formal approach is by means of independent review and inclusion alongside the peer-reviewed manuscript in the accepting journal, which is increasingly being used as a communicating strategy and subsequently shared on social media platforms. A less formal use of visual abstracts, is through journal clubs, blog posts and conference highlights providing educational value and personal knowledge development, as well as offering a mechanism and encouragement of discussion and debate. As the *Ulster Medical Journal* embarks on its visual abstract journey, it is intended that these will enhance interest in the published articles, increase awareness of the valuable research published in this journal and help to stimulate discussions and collaborations within medical research locally, nationally and internationally.

REFERENCES

- Henriksen D, Mishra P. Innovations in the dissemination of action research: Rhetoric, media, and communication. In: Mertler CA, editor. *The wiley handbook of action research in education*. Medford: John Wiley & Sons, 2019. p. 393- 413.
- National Institute for Health Research. Embedding a research culture. [monograph on Internet]. London: Department of Health & Social
- Care; 2022. [cited 2022 Mar 7]. Available from: <https://www.nihr.ac.uk/health-and-care-professionals/engagement-and-participation-in-research/embedding-a-research-culture.htm>
- Fire M, Guestrin C. Over-optimization of academic publishing metrics: observing Goodhart's Law in action. *GigaScience*. 2019;**8**(6):1-20. doi: org/10.1093/gigascience/giz053.
- Altmetric. Who's talking about your research? [Internet] London: Altmetric; 2022. [cited 2022 Mar 7]. Available from: <https://www.altmetric.com/>
- Plum Analytics. About PlumbX metrics. [Internet] Amsterdam: Elsevier. [cited 2022 Mar 7]. Available from: <https://plumanalytics.com/>
- Ramamurti P, Gu A, Fassihi SC, Stake S, Wei C, Campbell J, et al. Correlation between Altmetric score and traditional bibliometrics in total joint arthroplasty research. *Arthroplast Today*. 2021;**7**:225-9. doi: 10.1016/j.artd.2020.12.030.
- Simon HA. Designing organizations for an information-rich world. In: Greenberger M, editor. *Computers, communication, and the public interest: Conference proceedings*. Baltimore MD: The Johns Hopkins University Press, 1971. p. 37-72.
- Festré A, Garrouste P. The ‘Economics of Attention’: A history of economic thought perspective. [monograph on the Internet]. *Æconomia*. 2015;**5**-1:3-36. [cited 2022 Mar 7]. Available from: <https://journals.openedition.org/oeconomia/1139?lang=en>. DOI:<https://doi.org/10.4000/oeconomia.1139>
- Millar C, Moore J, Nutt T. Breaking down barriers: perspectives on why good research communication is a must. [monograph on Internet]. Amsterdam: Elsevier; 2021. [cited 2022 Mar 7]. Available from: <https://www.elsevier.com/connect/authors-update/breaking-down-barriers-perspectives-on-why-good-research-communication-is-a-must>
- Osler W. Books and men. In: *Aequanimitas with Other Addresses to Medical Students, Nurses and Practitioners of Medicine*. Philadelphia: Blakiston, 1904: 217-25.
- Kamtchum-Tatuene J, Zafack JG. Keeping up with the medical literature: Why, how, and when? *Stroke*. 2021;**52**(11):e746-e748. doi: 10.1161/STROKEAHA.121.036141.
- General Medical Council. Continuing professional development. Guidance for all doctors. [monograph on the Internet]. London: General Medical Council; 2012. [cited 2022 Mar 7]. Available from https://www.gmc-uk.org/-/media/documents/cpd-guidance-for-all-doctors-0316_pdf-56438625.pdf
- Kredo T, Bernhardsson S, Machingaidze S, Young T, Louw Q, Ochodo E, et al. Guide to clinical practice guidelines: the current state of play. *Int J Qual Health Care*. 2016;**28**(1):122-8.
- Bornmann L, Haunschild R, Mutz R. Growth rates of modern science: a latent piecewise growth curve approach to model publication numbers from established and new literature databases. [Internet] *Humanit Soc Sci Commun*. 2021;**8**:224. [cited 2022 Mar 7]. Available from: <https://www.nature.com/articles/s41599-021-00903-w>
- Osler W. Remarks on the medical library in post-graduate work. *Br Med J*. 1909;**2**(2544):925-8.
- Oska S, Lerma E, Topf J. A picture is worth a thousand views: a triple crossover trial of visual abstracts to examine their impact on research dissemination. *J Med Internet Res*. 2020;**22**(12):e22327. doi: 10.2196/22327.
- Ostergren M. (2013) How scientists develop competence in visual communication. [PhD Dissertation]. [Seattle, Washington]. University of Washington; 2013. 142 p. [cited 2022 Mar 7]. Available from <https://eric.ed.gov/?q=visual+communication&id=ED558690>
- Nayak S, Iwasa JH. Preparing scientists for a visual future. Visualization is a powerful tool for research and communication but requires training and



- support. *EMBO Rep.* 2019;**20**:e49347. doi: 10.15252/embr.201949347
19. Ibrahim AM. Seeing is Believing: Using Visual Abstracts to Disseminate Scientific Research. *Am J Gastroenterol.* 2018;**113**(4):459-61.
 20. Fuster V, Mann D. The art and challenge of crafting a central illustration or visual abstract. *J Am Coll Cardiol.* 2019;**74**(22):2816-20.
 21. Ibrahim AM. Visual Abstract Open source primer. The use of a visual abstract to disseminate scientific research. [Internet]. Ann Arbor, Michigan: University of Michigan; 2018. [cited 2022 Mar 7]. Available from <https://www.surgeryredesign.com/resources>
 22. Moura-Neto JA, Riella MC. Visual abstracts: an innovative way to disseminate scientific Information. *J Bras Nefrol.* 2020;**42**(3):357-60.
 23. West CC, Lindsay KJ, Hart A. Promoting your research using infographics and visual abstracts. *J Plast Reconstr Aesthet Surg.* 2020;**73**(12):2103-5.
 24. Costa RLD, Sória TC, Salles EF, Gerech AV, Corvisier MF, Menezes MAM, et al. Acute kidney injury in patients with Covid-19 in a Brazilian ICU: incidence, predictors and in-hospital mortality. *J Bras Nefrol.* 2021;**43**(3):349-58.
 25. Abbar M, Demattei C, El-Hage W, Llorca PM, Samalin L, Demaricourt P, et al. Ketamine for the acute treatment of severe suicidal ideation: double blind, randomised placebo controlled trial. *BMJ.* 2022;**376**:e067194. doi: 10.1136/bmj-2021-067194.
 26. Tummalapalli SL, Mendu ML, Struthers SA, White DL, Bieber SD, Weiner DE, et al. Nephrologist performance in the merit-based incentive payment system. *Kidney Med.* 2021;**3**(5):816-26.e1. doi: 10.1016/j.xkme.2021.06.006
 27. Ali B, Jiang Y, Agbim U, Kedia SK, Satapathy SK, Barnes M, et al. Effect of opioid treatment on clinical outcomes among cirrhotic patients in the United States. *Clin Transplant.* 2020;**34**(6):e13845. doi: 10.1111/ctr.13845.
 28. Lim M. How to create effective visual abstracts. [Internet]. Durham, North Carolina; 2021. [cited 2022 Mar 7]. Available from <https://people.duke.edu/~ms203/#/>.
 29. Warnock M, Ogonda L, Yew P, McIlvenny G. Antibiotic prophylaxis protocols and surgical site infection rates in trauma surgery: a prospective regional study of 26,849 procedures. *Ulster Med J.* 2019;**88**(2):111-4.
 30. Stuart M, Mooney C, Hrabovsky M, Silvestri G, Stewart S. Surgical planning during a pandemic: Identifying patients at high risk of severe disease or death due to COVID-19 in a cohort of patients on a cataract surgery waiting list. *Ulster Med J.* 2022;**91**(1):19-25.
 31. Ghani R, O'Connor A, Sajid I, Johnson G, Ullah S. Diagnostic accuracy of ultrasound in the paediatric population with acute right iliac fossa pain, our District General Hospital experience. *Ulster Med J.* 2022;**91**(1):26-9.
 32. Lin H, Hsieh Y-C, Wu F-G. A study on the relationships between different presentation modes of graphical icons and users' attention. *Comput Hum Behav.* 2016;**63**:218-28.
 33. Allen HG, Stanton TR, Di Pietro F, Moseley GL. Social media release increases dissemination of original articles in the clinical pain sciences. *PLoS One.* 2013;**8**(7):e68914. doi: 10.1371/journal.pone.0068914.
 34. Dean B. How many people use Twitter in 2022? [New Twitter Stats]. [Internet]. Cheyenne, Wyoming: Backlinko; 2022. [cited 2022 Jan 5]. Available from: <https://backlinko.com/twitter-users>
 35. Rodrigues J. Get more eyes on your work: visual approaches for dissemination and translation of education research. *Educ Res.* 2021;**50**(9):657-63. <https://doi.org/10.3102/0013189X211035351>
 36. Koo K, Aro T, Pierorazio PM. Impact of social media visual abstracts on research engagement and dissemination in urology. *J Urol.* 2019;**202**(5):875-77.
 37. Erskine N, Hendricks S. The use of twitter by medical journals: systematic review of the literature. *J Med Internet Res.* 2021;**23**(7):e26378. doi: 10.2196/26378.
 38. Lindquist LA, Ramirez-Zohfeld V. Visual abstracts to disseminate geriatrics research through social media. *J Am Geriatr Soc.* 2019;**67**(6):1128-31.
 39. Hoffberg AS, Huggins J, Cobb A, Forster JE, Bahraini N. Beyond journals-visual abstracts promote wider suicide prevention research dissemination and engagement: a randomized crossover trial. *Front Res Metr Anal.* 2020; **5**:564193. doi: 10.3389/frma.2020.564193.
 40. Chapman SJ, Grossman RC, Fitzpatrick MEB, Brady RRW. Randomized controlled trial of plain English and visual abstracts for disseminating surgical research via social media. *Br J Surg.* 2019; **106**(12):1611-16. doi: 10.1002/bjs.11307.
 41. Hou LT, Pierorazio PM, Koo K. Impact of social media visual abstracts on media attention and literature citation in urology. *J Urol.* 2020;**204**(5):905-6.
 42. Bellini MI, Montserrat N, Naesens M, Neyens T, Schneeberger S, Berney T. The power of online tools for dissemination: social media, visual abstract, and beyond. *Transpl Int.* 2021;**34**(7):1174-6.
 43. Keller DS, Grossman RC, Winter DC. Choosing the new normal for surgical education using alternative platforms. *Surgery (Oxf).* 2020;**38**(10):617-22.
 44. Turck CJ, Silva MA, Tremblay SR, Sachse SL. A preliminary study of health care professionals' preferences for infographics versus conventional abstracts for communicating the results of clinical research. *J Contin Educ Health Prof.* 2014;**34**(S1): S36-S38. doi.org/10.1002/chp.21232
 45. Hughes AJ, McQuail P, Keogh P, Synnott K. Infographics improve comprehension and recall at the orthopaedic journal club. *J Surg Educ.* 2021;**78**(4):1345-9.
 46. Tancock C. Picture this: a stimulating way of opening up your research to new audiences. How visual abstracts can help you get noticed. [Internet] Amsterdam: Elsevier; 2021. [cited 2022 Mar 7]. Available from: <https://www.elsevier.com/connect/authors-update/vga>
 47. Emory University School of Medicine, Department of Medicine. Visual Abstract. [Internet]. Atlanta, GA: Emory University; 2022. [cited 2022 Mar 18]. Available from <https://med.emory.edu/departments/medicine/divisions/infectious-diseases/covid19-roundup/visual-abstracts.html>
 48. Boston University Medical Campus. John McCahan Medical Campus Education Day. Visual Abstracts. [Internet]. Boston: Boston University; 2021. [cited 2022 Mar 18]. Available from <https://www.bumc.bu.edu/jmedday/abstracts/visual-abstracts/>
 49. The ISN Virtual World Congress of Nephrology [Internet]. Montreal: WCN'21; 2021. [cited 2022 Mar 18]. Available from <https://www.theisn.org/wcn21/program/wcn21-visual-abstracts/>
 50. Developing Excellence in Medical Education Conference. Posters: Poster types: Visual abstracts. Manchester: DEMEC; 2021. [cited 2022 Mar 18]. Available from <https://www.demec.org.uk/posters/>.
 51. Harris C. Use of visual abstracts & live tweeting at academic meetings. In: Ibrahim AM, editor. Use of a visual abstract to disseminate scientific research. [monograph on the Internet]. Ann Arbor, Michigan; 2019. [cited 2022 Mar 7]. Available from https://static1.squarespace.com/static/5854aaa044024321a353bb0d/t/5a527aa89140b76bbfb2028a/1515354827682/VisualAbstract_Primer_v4_1.pdf
 52. Shingada AK, Conjeevaram A. SAT-488 Live visual abstracts: A new means of disseminating scientific information, live, from a conference. *Kidney Int Rep.* 2020;**5**(3):S204. DOI:10.1016/j.kir.2020.02.520
 53. Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report (MMWR). MMWR Visual Abstracts. [Internet] Atlanta, Georgia: CDC; 2020. [cited 2022 Mar 7]. Available from https://www.cdc.gov/mmwr/MMWR_VisualAbstracts.html
 54. McKnight-Eily LR, Okoro CA, Turay K, Acero C, Hungerford D. screening for alcohol use and brief counseling of adults - 13 states and the district of Columbia, 2017. *MMWR Morb Mortal Wkly Rep.* 2020;**69**(10):265-70.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Clinical Paper

Is qFIT a useful tool in prioritising symptomatic patients referred with suspect colorectal cancer in the COVID-19 era?

Sarah Small, Rachael Coulson, Robert Spence, and Ian McAllister

ABSTRACT

Background: The COVID-19 pandemic is an evolving healthcare challenge causing secondary disruption of cancer services. Quantitative Faecal Immunochemical Testing (qFIT) has been established as a screening method in asymptomatic patients. We aim to assess its utility as a triage tool to prioritise investigations in symptomatic patients with suspected colorectal cancer.

Methods: At the commencement of the COVID-19 pandemic a database was established to include patients awaiting red flag outpatient consultation or colonic investigations and new red flag referrals from March to June 2020. Patients were supplied with qFIT kits and returned results categorised into 3 priority groups according to the qFIT value. Group 1 $>150\mu\text{g Hb/g}$, Group 2 ≥ 10 to $\leq 150\mu\text{g Hb/g}$ and Group 3 $<10\mu\text{g Hb/g}$. Subsequent colonic evaluation was offered by colonoscopy or cross-sectional imaging with urgency determined by qFIT priority group. When identified colorectal cancer, inflammatory bowel disease or high-risk polyps were recorded as “significant colorectal pathology.”

Findings: Three hundred and seventeen patients were identified with data analysed on 290 patients. Colorectal malignancy was identified in 17 patients; 94% of these patients were in Group 1. A qFIT result $>150\mu\text{g Hb/g}$ had a sensitivity and specificity for colorectal cancer of 94.12% (95% CI 71.31-99.85) and 91.21% (95% CI 87.20-94.29) respectively. No malignancy was detected in Priority Group 3; negative predictive value of 100% (95% CI 98.06-100).

Conclusions: In symptomatic, suspect lower GI cancer patients qFIT is a useful adjunct for prioritising patients and can be used to determine the urgency of colorectal investigations.

Key words: Quantitative Faecal immunochemical testing, qFIT, Colorectal cancer, symptomatic, COVID-19

INTRODUCTION

Cessation of services and disruption of established cancer pathways are secondary healthcare implications of the COVID-19 pandemic.¹ This has resulted in a greater burden on existing healthcare waiting lists which already have limited resources.^{2,3} Faecal immunochemical testing (FIT)

has been integrated as a colorectal cancer (CRC) screening method since 2017 across parts of the UK.⁴ It has been used for screening asymptomatic patients to detect early colorectal malignancy. In the current COVID-19 climate, this technique has been used as a triaging adjunct with symptomatic colorectal patients, identifying those at greatest risk of significant colorectal pathology, ultimately allowing prioritisation of endoscopic and radiological investigation.

As the 4th most prevalent malignancy in the UK, colorectal cancer represents 10% of all cancer deaths in the UK, with 42,300 new cases per annum.⁵ When detected at an early stage, colorectal cancer is associated with significantly better outcomes reflected by its recognised screening programme.^{6,7} Colonoscopy remains the gold standard of colorectal investigation, with CT Colonography a suitable alternative in the appropriate patient.⁸

Research to date has focused on the use of Quantitative Faecal Immunochemical Testing (qFIT) in the asymptomatic patient and comparing use of faeces analysis - FIT vs guaiac-based faecal occult blood (FOB) testing.^{9,10,11} There is a paucity of evidence of the use of qFIT to triage referrals in the symptomatic colorectal patient.¹²

Aim

We aim to evaluate the quantitative relationship between qFIT value and the detection of significant colorectal pathology, determining its utility as a triage tool to prioritise investigations in patients with red flag colorectal symptoms.

METHODS AND MATERIALS

At the commencement of the COVID-19 pandemic (March 2020), a prospective database was established of all patients awaiting a colorectal red flag outpatient appointment, or colonic investigations, either endoscopically or via cross-sectional imaging. In addition, all new consecutive referrals triaged as red flag or urgent with symptoms concerning for gastrointestinal pathology were included from March

General and Colorectal Surgical Unit,
Ulster Hospital, Dundonald,
Belfast, UK

Correspondence to: Ms Sarah Small
Email: ssmall@doctors.org.uk



2020 to July 2020. Referrals were inclusive of those from primary care, specialty referral, and inpatient follow-up to the General Surgery or Gastroenterology services. Four hundred and fifty-six patients were supplied with qFIT kits via the post. A database of 317 patients who returned qFIT kits was created with those excluded following consultant led discharge and non-responders. Quantitative analysis was carried out via automated standardised analysers and all returned results were categorised by qFIT value. Patients who did not respond were given further opportunity to return via written communication.

All 317 patients were offered colonic evaluation either by colonoscopy or cross-sectional imaging. The priority of this investigation during the pandemic was determined by their quantitative FIT result: Priority Group 1: qFIT >150mg Hb/g, Priority Group 2: qFIT ≥10 to ≤150µg Hb/g, and Priority Group 3: qFIT <10mg Hb/g.

Outcome data was collected prospectively throughout the evolving pandemic with the introduction of qFIT over the four month period. Further exclusion criteria were determined: asymptomatic patients undergoing investigation as part of screening; patients within their 5-year cancer post-op surveillance period; declining investigation through the patient's own choice.

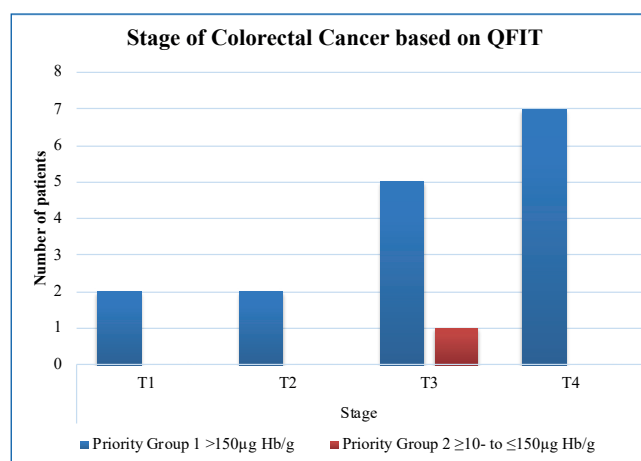
Analysis

A comprehensive review of each patient's electronic care record and medical notes were completed. Patient demographics, qFIT value, referral information, serum haemoglobin (Hb), investigation modality, and diagnosis were recorded. Significant colorectal pathology was defined as colorectal cancer, inflammatory bowel disease, or high-risk polyps when diagnosed at time of colonoscopy or cross-sectional imaging. British Society of Gastroenterology define high-risk polyps as 2 or more premalignant polyps including at least one advanced colorectal polyp (defined as a serrated polyp of at least 10mm in size or containing any grade of dysplasia, or an adenoma of at least 10mm in size of containing high-grade dysplasia); or 5 or more premalignant polyps.¹³ When significant pathology was identified, these patients were categorised according to qFIT value and stage and treatment of disease were recorded. Statistical analysis was performed with IBM SPSS using Chi-Square and ANOVA techniques.¹⁴ Significance was defined as a *p* value of less than 0.05. Diagnostic test evaluation was performed using MedCalc statistical software.¹⁵

RESULTS

A total of 317 patients were identified; 290 of which were analysed following application of exclusion criteria. These 290 patients were categorised into three priority groups based on their qFIT value; Priority Group 1 >150mg Hb/g, Priority Group 2 ≥10 to ≤150µg Hb/g and Priority Group 3 <10mg Hb/g. The characteristics of red flag symptomatic patients are categorised by qFIT value outlined in *Table 1*.

Figure 1. Stage of colorectal cancer by qFIT group



Pathology identified across the population group included GI malignancy, inflammatory bowel disease, high and low risk polyps, inflammatory (diverticulitis, infective, and microscopic colitis), and proctology. Distribution of pathology characterised by priority group is demonstrated in *Table 2*. Colorectal investigation yielded pathology in 181 (63%) patients with no pathology identified in the remaining 109 (37%) patients.

Malignancy was detected in 18 patients across the 290 patients; CRC identified in 17 patients and an upper GI cancer in 1 patient. 16 of 17 CRC were identified in priority group 1 (>150mg Hb/g). No malignancy was detected in priority group 3 (<10mg Hb/g). *Figure 1* outlines graphical depiction of colorectal cancer by qFIT group; 77% of CRC detected was advanced stage (T3 and T4).

Priority group 1 contained 40 patients (21 male (53%)), with a median age of 64 years (range 36 – 88 years). 38 patients underwent endoscopy and 2 CT imaging. Colorectal malignancy was diagnosed in 16 patients (40%). Significant pathology was identified in 23 patients (58%), of which 16 (40%) were diagnosed with Colorectal malignancy.

Priority group 2 had 62 patients (27 male (44%)), with median age of 68 years (range 29 – 90 years). 58 patients underwent endoscopy and 4 CT imaging. Colorectal malignancy was diagnosed in 1 patient (2%). Significant pathology was identified in 6 patients (10%).

Priority group 3 contained 188 patients (83 male (44%)), with median age of 64 years (range of 26 – 92 years). 182 patients underwent endoscopy and 6 CT imaging. No malignancy was detected in Priority Group 3. Significant pathology was identified in 6 patients (3%).

Two hundred and seventy-eight patients underwent endoscopic evaluation (98% colonoscopy; 2% flexible sigmoidoscopy) and 12 patients underwent cross sectional CT imaging (67% CT Colonogram; 33% CT abdomen, pelvis).



Table 1: Characteristics of red flag symptomatic patients categorised by qFIT value.

Characteristic	Priority Group 1 >150µg Hb/g		Priority Group 2 ≥10 to ≤150µg Hb/g		Priority Group 3 <10µg Hb/g	
	N = 40		N = 62		N = 188	
	Number	%	Number	%	Number	%
Age, years						
Median (IQR)	64 (52-76)		68(58-77)		64 (54-72)	
<50	6	15	6	10	33	18
50-59	8	20	14	23	42	22
60-69	11	28	13	21	54	29
70-79	6	15	16	26	50	27
≥80	9	23	13	21	9	5
Gender						
Men	21	53	27	44	83	44
Women	19	48	35	56	105	56
Hb						
Median	135		128		136	
Unknown	5	13	7	11	30	16
Imaging						
Endoscopy	38	95	58	94	182	97
CT	2	5	4	6	6	3

Pathology	Priority Group 1 >150µg Hb/g		Priority Group 2 ≥10 to ≤150µg Hb/g		Priority Group 3 <10µg Hb/g	
	Number	%	Number	%	Number	%
Lower GI Cancer	16	40	1	2	0	0
Other	0	0	1	2	0	0
IBD	3	8	2	3	0	0
All Polyps	13	33	19	31	43	23
*High Risk Polyp	4		2		6	
Inflammatory	3	8	16	8	44	23
Proctology	0	0	6	0	14	7
NAD	5	13	17	13	87	46
Total	40		62		188	

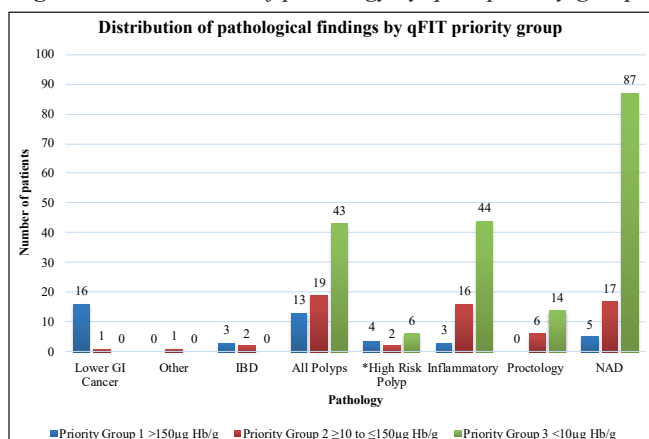
Table 2: Distribution of pathology categorised by priority group.

The age distribution between the three priority groups did not differ significantly (ANOVA f-ratio value 2.81; $p>0.05$). A Chi-squared test of independence showed that there was no significant association between gender and qFIT value, $X^2(1, N=290) = 1.0127, p = 0.602$.

Patients' blood test results at time of referral were assessed in 248 cases. Median serum Hb 135 (75 – 165 g/dL) in priority group 1, 128 (70 - 160 g/dL) for priority group 2, and Hb 136 (75 – 165 g/dL) for priority group 3. At time of

referral amongst the cancer population diagnosed, 47% were anaemic.

Priority group 1 had a sensitivity and specificity for colorectal cancer of 94.12% (95% CI 71.3-99.85) and 91.21% (95% CI 87.20-94.29) respectively. In addition, carried a positive predictive value (PPV) of 40% (95% CI 30.88-49.87), and negative predictive value (NPV) 99.6% (95% CI 97.38-99.94), respectively. Priority group 1 had a sensitivity and specificity for significant colorectal pathology of 65.71%

Figure 2: Distribution of pathology by qFIT priority group.

(95% CI 47.79-80.87) and 93.33% (95% CI 89.54 - 96.07), respectively. In addition, carried a PPV of 57.5% (95% CI 44.63-69.43) and NPV of 95.2% (95% CI 92.60-96.91).

The negative predictive value of priority group 2 associated with any significant colorectal pathology was 96.81% (95% CI 94.49-98.17). Within this group the NPV of colorectal cancer was 96.81% (95% CI 95.69-97.64) with a sensitivity and specificity of 14.29% (95% CI 0.36-57.87) and 74.9% (95% CI 68.96-80.22), respectively.

No cancer was identified in priority group 3 with a specificity of 100% (95% CI 98.06-100) and NPV for cancer of 100%. Figure 2 displays distribution of pathology by qFIT priority group.

Sixteen percent of polyps identified were high-risk polyps. 33% of the high-risk polyps were in priority group 1. 50% were in priority group 3.

DISCUSSION

Analysis of the quantitative relationship between qFIT value and the detection of significant colorectal pathology in symptomatic patients has been demonstrated. Additionally, it was illustrated that a higher qFIT value correlates to increased incidence of colorectal cancer detection. Investigation in this patient group should be triaged with greatest urgency and a lower qFIT value can be down triaged.

Allison *et al* has demonstrated the use of qFIT in the asymptomatic patient.¹⁶ We report the first use of qFIT in symptomatic patients in Northern Ireland during the COVID-19 pandemic. A well-established screening programme and red flag cancer service for suspected lower gastrointestinal pathology exists.^{5,6} However, prior to March 2020, qFIT was not included in Northern Ireland screening or red flag referral pathways. The focus of research to date has centred around the use of qFIT in the asymptomatic patient and its use in screening.^{17,18,19} Studies have reported the challenges in accordance with 2017 DG30 NICE guidance of integration of qFIT into primary care pathways.⁴ Lack of guidance awareness and limited access to qFIT testing

have been highlighted as contributing to these challenges.²⁰ Supporting evidence as early as 2015 has demonstrated the use of faecal Hb as an exclusion test with high NPV for significant colorectal disease.¹² qFIT in the symptomatic patient has been assessed with overall diagnostic accuracy for CRC in patients with red flag symptoms and has been shown to be useful beyond NICE referral criteria alone.^{21, 22} Evidence to date has also explored that a single FIT sample is suffice to obtain a reliable result.^{23,24}

Direct visualisation via colonoscopy remains the gold standard test for colorectal cancer diagnosis.^{3,6} Common presenting symptoms of rectal bleeding, altered bowel habit, and anaemia constitute signs necessitating referral for clinical assessment and possible investigation.²⁵ This adheres to the recognised benefit of early colorectal cancer detection and correlates to reduced mortality than late detection of advanced stage of pathology.^{5,6}

During this unpredicted time, national guidance limited endoscopy allocation to emergent and essential only.¹ A strategy for healthcare provision within these restrictions had to be developed. In symptomatic patients, qFIT was used as a method of stratification and distribution of resources to identify significant colorectal pathology at an early stage and prioritise those at greatest need. Our results have demonstrated a quantitative relationship between qFIT value and the detection of significant pathology on investigation.

We have demonstrated across our patient population that the detection of colorectal cancer was associated with a higher qFIT score. A lower value conferred a more unremarkable investigation and therefore a low risk of cancer pathology. Endoscopic colonic evaluation was carried out in the majority of cases, as remains the gold standard investigation in the appropriate patient. A higher qFIT value categorised as priority 1 patients were offered investigation more promptly compared to the other priority groups. The results from this priority group 1 yielded a greater number of cases of colorectal cancer detection as well as further significant pathology in over half the patients in this group. Amongst this group, 47% of patients were anaemic which is reflected in the need for haematological work-up and primary care evaluation.²⁰ The median age between priority groups did not differ significantly and a male preponderance was seen in priority group 1, compared to priority groups 2 and 3.

The challenge moving through this pandemic for both surgeons and gastroenterologists is navigating the imbalance between growing referral and waiting lists with restricted investigation and surgical provision. Our suggestion from our evaluation is that a high qFIT value should result in expedient investigation and true red flag assessment. Those that fall within the middle priority group 2, cancer pathology may be present but carries a negative predictive value of 96.81%. However, significant colorectal pathology has been demonstrated on investigation. These conditions may be readily treatable and also pre-cancerous so should be investigated in an urgent manner.²⁶ In priority group 3,



a negative predictive value for colorectal cancer detection of 100% was established but high-risk polyps were still a significant finding amongst this group. In practice, these symptomatic priority 3 patients with low qFIT results should still undergo appropriate investigation, but the other symptomatic groups should be prioritised. This approach demonstrates a strategy of resource allocation using qFIT value distributing resources to those in greatest need.

Limitations

Our study size is not sufficient to definitively show that no further investigation is required in symptomatic patients with a low qFIT. A return rate of 70% qFIT tests within this study is favourable when compared with other studies in this area.¹² All initial non-responders were followed up with further written communication to ensure the highest possible response rate. The COVID-19 pandemic has created a challenging environment for research with rapid and dynamic guidance development but also the opportunity for transformation of practice.

Clinical implication and future research

We have demonstrated a quantitative relationship between qFIT value and colorectal cancer which highlights its utility as a triage tool for resources. Therefore, its role should be considered as an integral constituent of the primary care red flag referral pathway for symptomatic patients. Future research should focus on larger population studies to determine if it is possible to risk stratify further the low priority qFIT group to safely eliminate unnecessary investigations.

CONCLUSION

As we meet the challenges of the immediate and longer-term impact of the COVID-19 pandemic on healthcare, a consolidated approach to resource allocation is required. qFIT enables prioritisation of the patient pathway of those with suspected significant colorectal pathology and allows most effective use of resources based on the appropriate risk stratification.

REFERENCES

1. British Society of Gastroenterology. Endoscopy activity and COVID-19: BSG and JAG guidance. [monograph on the Internet]. London: British Society of Gastroenterology; 2021. [cited 2020 Nov 11]. Available from: <https://www.bsg.org.uk/covid-19-advice/endoscopy-activity-and-covid-19-bsg-and-jag-guidance/>
2. Bowel Cancer UK. Unacceptable endoscopy waiting times put launch of new world-class screening programme at risk. [monograph on the Internet]. London: Bowel Cancer UK; 2018. [cited 2020 Oct 22]. Available from: <https://www.bowelcanceruk.org.uk/news-and-blogs/news/unacceptable-endoscopy-waiting-times-put-launch-of-new-world-class-screening-programme-at-risk/>
3. Banerjee A, Voll J, Chowdhury A, Siddika A, Thomson S, Briggs R, et al. Straight-to-test colonoscopy for 2-week- wait referrals improves time to diagnosis of colorectal cancer and is feasible in a high-volume unit. *Colorectal Dis*. 2017; 19(9): 819–26.
4. NICE. Diagnostics guidance [DG30]. Quantitative faecal immunochemical

- tests to guide referral for colorectal cancer in primary care. [monograph on the Internet]. London: National Institute for Health and Care Excellence; 2017. [cited 2020 Oct 22]. Available from: <https://www.nice.org.uk/guidance/dg30>
5. Office for National Statistics. Cancer survival by stage at diagnosis for England (experimental statistics): adults diagnosed 2012, 2013 and 2014 and followed up to 2015. [monograph on the Internet]. London: Office for National Statistics; 2016. [cited 2020 Sep 25]. Available from: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/cancersurvivalbystageatdiagnosisforenglandexperimentalstatistics/adultsdiagnosed20122013and2014andfollowedupto2015>
6. Bowel Cancer UK. Early diagnosis. [monograph on the Internet]. London: Bowel Cancer UK; 2018. [cited 2020 Oct 22]. Available from: <https://www.bowelcanceruk.org.uk/campaigning/early-diagnosis>
7. Bowel Cancer UK. An optimal bowel cancer screening programme. [monograph on the Internet]. London: Bowel Cancer UK; 2018. [cited 2020 Oct 22]. Available from: <https://www.bowelcanceruk.org.uk/news-and-blogs/research-blog/an-optimal-bowel-cancer-screening-programme/>
8. Issa IA, Noureddine M. Colorectal cancer screening: An updated review of the available options. *World J Gastroenterol*. 2017;23(28):5086–96.
9. Wilén HR, Blom J, Hoijer J, Hultcrantz R. Fecal immunochemical test in colorectal cancer screening: Colonoscopy findings by different cut-off levels. *J Gastroenterol Hepatol* 2019;34(1):103–12.
10. Park DI, Ryu S, Kim YH, Lee SH, Lee CK, Eun CS et al. Comparison of guaiac-based and quantitative immunochemical fecal occult blood testing in a population at average risk undergoing colorectal cancer screening. *Am J Gastroenterol*. 2010;105(9):2017–25.
11. Yuan SY, Wu W, Fu J, Lang YX, Li JC, Guo Y, et al. Quantitative immunochemical fecal occult blood test for neoplasia in colon cancer screening. *J Dig Dis*. 2019;20(2):78–82.
12. Godber IM, Todd LM, Fraser CG, MacDonald LR, Younes HB. Use of a faecal immunochemical test for haemoglobin can aid in the investigation of patients with lower abdominal symptoms. *Clin Chem Lab Med*. 2016;54(4):595–602.
13. Rutter MD, East J, Rees CJ, Cripps N, Docherty J, Dolwani S, et al. British Society of Gastroenterology/Association of Coloproctology of Great Britain and Ireland/Public Health England post-polypectomy and post-colorectal cancer resection surveillance guidelines. *Gut*. 2020;69(2):201–23.
14. IBM Corporation. IBM SPSS Statistics for Windows. [Internet]. Version 22.0. Armonk, NY: IBM Corp USA; 2013.
15. MedCalc Software Ltd. MedCalc: statistical software package for biomedical research. [Internet]. Version 19.6.4. Ostend, Belgium: MedCalc Software Ltd.; 2016. Available from: <https://www.medcalc.org>.
16. Allison JE, Fraser CG, Halloran SP, Young GP. Population screening for colorectal cancer means getting FIT: the past, present, and future of colorectal cancer screening using the fecal immunochemical test for hemoglobin (FIT). *Gut Liver*. 2014;8(2):117–30.
17. van Rossum LG, van Rijn AF, Laheij RJ, van Oijen MG, Fockens P, van Krieken HH, et al. Random comparison of guaiac and immunochemical fecal occult blood tests for colorectal cancer in a screening population. *Gastroenterology*. 2008;135(1):82–90.
18. Levi Z, Birkenfeld S, Vilkin A, Bar-Chana M, Lifshitz I, Chared, M, et al. A higher detection rate for colorectal cancer and advanced adenomatous polyp for screening with immunochemical fecal occult blood test than guaiac fecal occult blood test, despite lower compliance rate. A prospective, controlled, feasibility study. *Int J Cancer*. 2011;128(10):2415–24.

19. Robertson DJ, Lee JK, Boland CR, et al. . Recommendations on Fecal Immunochemical Testing to Screen for Colorectal Neoplasia: A Consensus Statement by the US Multi-Society Task Force on Colorectal Cancer. *Gastroenterology*. 2017; 152(5): 1217-37. doi: 10.1053/j.gastro.2016.08.053. Epub 2016 Oct 19.
20. Von Wagner C, Stoffel ST, Freeman M, Laszlo HE, Nicholson BD, Sheringham J, et al. General practitioners' awareness of the recommendations for faecal immunochemical tests (FITs) for suspected lower gastrointestinal cancers: a national survey. *BMJ Open*. 2019;9(4):e025737. doi: 10.1136/bmjopen-2018-025737.
21. Katsoula A, Paschos P, Haidich AB, Tsapas A, Giouleme O. Diagnostic accuracy of fecal immunochemical test in patients at increased risk for colorectal cancer: a meta-analysis. *JAMA Intern Med*. 2017;177(8):1110-8.
22. Cubiella J, Salve M, Díaz-Ondina M, Vega P, Alves MT, Iglesias F, et al. Diagnostic accuracy of the faecal immunochemical test for colorectal cancer in symptomatic patients: comparison with NICE and SIGN referral criteria. *Colorectal Dis*. 2014;16(8):O273-82. DOI: 10.1111/codi.12569
23. Wu D, Luo HQ, Zhou WX, Qian JM, Li JN. The performance of three-sample qualitative immunochemical fecal test to detect colorectal adenoma and cancer in gastrointestinal outpatients: an observational study. *PLoS One*. 2014;9(9):e106648. doi: 10.1371/journal.pone.0106648
24. Auge JM, Fraser CG, Rodriguez C, Roset A, Lopez-Ceron M, Grau J, et al. Clinical utility of one versus two faecal immunochemical test samples in the detection of advanced colorectal neoplasia in symptomatic patients. *Clin Chem Lab Med*. 2016;54(1):125-32.
25. SIGN. Diagnosis and management of colorectal cancer. [monograph on the Internet]. Edinburgh: Scottish Intercollegiate Guidelines Network; 2011. [cited 2017 May 8]. Available from: <https://www.sign.ac.uk/our-guidelines/diagnosis-and-management-of-colorectal-cancer/>
26. Oono Y, Iriguchi Y, Doi Y, Tomino Y, Kishi D, Oda J, et al. A retrospective study of immunochemical fecal blood testing for colorectal cancer detection. *Clin Chim Acta*. 2010;411(11-12):802-5.



Review

Comparison of innovative communication approaches in nutrition to promote and improve health literacy

Hannah L. Anderson¹, John E. Moore^{1,2,3*} and Beverley C. Millar^{1,2,3}

ABSTRACT

The translation of scientific evidence into guidelines and advice is a fundamental aspect of scientific communication within nutrition and dietetics. For communication to be effective for all patients, health literacy (HL) must be considered, i.e. an individual's capacity to obtain, comprehend and utilise information to empower decision-making and promote their own health. HL levels are varied and difficult to judge on an individual basis and have not been quantified, thus not giving a population mean HL competency indication. It has been evidenced that most of the working age population in England cannot comprehend healthcare materials due to complexity, thereby promoting a need for agreed readability thresholds for written healthcare information. A wide range of modalities within dietetics are used to communicate to a varied audience with the primary form written, e.g. journal articles, plain language summaries and leaflets. Audio/visual and digital communications are increasing in dietetic care and welcomed by patients; however, the effectiveness of such approaches has not been studied thoroughly and digital exclusion remains a concern. Communication considering a patient's HL level leads to empowerment which is key to effective management of chronic diseases with a high treatment burden. Therefore; this review will focus on the importance of modalities used to communicate science in nutrition to ensure they are appropriate in relation to Health Literacy.

Keywords: cystic fibrosis (CF), effective communication, health literacy, readability, scientific communication

INTRODUCTION

Scientific communication (SC) is defined as scientific information transmission to a specialised/non-specialist audience by methods such as verbal explanation, writing, lectures and digital means [1]. Effective SC is important when securing research funding, in media communication and informing policy. Within healthcare, SC is vital, especially as the final stakeholders for health-related research are patients, thereby directly impacting their health [2].

It is recognised that low patient literacy has been linked to poorer health outcomes, affecting how clinicians deliver healthcare [3]. Literacy is the extent of ability to read, write and have the skills to recognise words and understand text [4]. Health literacy (HL) extends this definition, further including comprehension of scientific knowledge,

and having accessibility and skills to make appropriate health-related decisions [5]. In effective communication, information is given by methods appropriate to the patient's HL level. DeWalt and colleagues noted that clinicians are generally poor judges of patient HL levels and so developed a HL universal precautions (HLUP) toolkit to help deliver healthcare information at a low HL level in a General Practice [6]. It has been shown that as many as four in 10 adults in the UK struggle to understand and use typical medical information designed for the public [7], where such low HL has been linked to a range of problems, including poor general health, inappropriate use of health services and reduced life expectancy [7]. The majority of adults in England are in the 11-14 year old reading age group [8] and Table 1 shows the levels of literacy related to age and understanding in a health setting [8].

Dietitians must not only understand the scientific mechanisms behind nutrition and grasp the research methods needed to critically appraise the evidence, but they must also communicate appropriate information clearly at patients' understanding levels. Thus, dietetics has been described as both an art and a science [9]. Dietitians artfully communicate scientific findings through varied modalities at a populationally understandable level to promote health, prevent disease and manage conditions. Therefore, the aim of this article is to discuss communication approaches and modalities which influence HL both within healthcare and specifically dietetics, in order to improve and promote HL in patients.

Health Literacy

The concept of HL, originally only alluded to functional literacy, i.e. the ability to read, understand and follow health information and advice, has evolved extensively [11] (Table 2). HL is a dynamic concept, as over a patient's lifetime their HL capacity can change, with degree of cognitive and physical health altering with age or disease stage [23].

¹ School of Biomedical Sciences, Ulster University, Cromore Road, Coleraine, Co. Londonderry, Northern Ireland, BT52 1SA, UK,

² Northern Ireland Regional Adult Cystic Fibrosis Centre, Level 8, Belfast City Hospital, Lisburn Road, Belfast, Northern Ireland, BT9 7AB, UK,

³ Laboratory for Disinfection and Pathogen Elimination Studies, Northern Ireland Public Health Laboratory, Belfast City Hospital, Lisburn Road, Belfast, Northern Ireland, BT9 7AD, UK.

*corresponding author: Professor John E. Moore

E-mail: jemoore@niph1.dnet.co.uk



Literacy national standard	Age and school level	Adults will be able to:	In a health setting adults will be able to:
Entry 1	Typical 7 year old	<ul style="list-style-type: none"> • read short texts with repeated language patterns on familiar topics • read signs and symbols, produce limited writing – only short sentences • engage in simple exchanges of information 	<ul style="list-style-type: none"> • understand pictures on a health promotion poster • read and understand 'way in' and 'way out' signs but not 'entrance' and 'exit' signs • tell a clinician that they are not feeling well but not describe degrees or type of pain
Entry 2	Typical 9 year old	<ul style="list-style-type: none"> • read short straightforward texts on familiar topics • obtain information from familiar sources (e.g. a leaflet, a short letter) • show some awareness of audience when writing (e.g. a short informal letter or note) • engage in discussions with familiar people 	<ul style="list-style-type: none"> • understand the words on a simple poster such as 'smoking is bad for you' • understand the words but not necessarily the numbers of a routine appointment letter • tell a clinician in simple language the degree and type of pain they have
Entry 3	Typical 11 year old	<ul style="list-style-type: none"> • read more accurately and independently • obtain information from everyday sources e.g. newspapers • communicate (orally and in writing) information and opinions with some adaptation to the intended audience 	<ul style="list-style-type: none"> • understand the words on more complex posters and simply worded leaflets • understand short formal letter, note or form, telephone call to 111 • describe in more detail degree and type of pain and understand what they have been prescribed by a clinician
Level 1	GCSE grade D-F	<ul style="list-style-type: none"> • read texts of varying lengths on a variety of topics • obtain information from different sources (simple reports, text books, work manuals) • in written communication, demonstrate an ability to express ideas and opinions clearly using length, format and style appropriate to audience and purpose (formal letter, memo, brief report etc) • be confident in oral communication • make contributions to discussions that demonstrate awareness of others' views 	<ul style="list-style-type: none"> • understand more complex information on a variety of different health related matters e.g. health promotion information on the importance of diet and simple clinical information, mediated and interpreted in a supported manner • can describe confidently degree and severity of pain • understand simple oral instructions but not the importance of compliance or can clarify what they have been told
Level 2	GCSE grade A*-C	<ul style="list-style-type: none"> • read from texts of varying complexity accurately and independently (more complex books, text books, report, training manuals) • write to communicate information, ideas and opinions clearly and effectively using length, format and style appropriate to purpose, content and audience (e.g. complex letter, essay, reports) • make a brief presentation or speak in a meeting 	<ul style="list-style-type: none"> • understand and interpret more complex information on a variety of different health related matters e.g. health promotion information on the importance of diet and simple clinical information, mediated and interpreted in a supported manner • volunteer unsolicited information about degree and severity of pain • ask simple questions in order to gain an understanding of the rationale behind a prescribed course of treatment

Table 1: Levels of literacy related to age and understanding in a health setting [Taken from "Health Literacy "How to" Guide: NHS Health Education England

(Available at <https://library.nhs.uk/wp-content/uploads/sites/4/2020/08/Health-literacy-how-to-guide.pdf>)]

As a result of the association between low HL and poorer health outcomes [4], much research explores the possible link between poor chronic disease management and low HL. An adequate level of HL is needed to empower individuals to take charge of their own health or care for another, especially when they are critically involved in disease management e.g. diabetes [24].

A range of interventions to improve health knowledge in people with lower HL levels has been systematically reviewed by Pignone and colleagues [25], however, consistent differences in health knowledge pre and post intervention were not found. Intra-intervention differences were too various to draw firm conclusions and the studies reviewed often did not compare high and low literacy groups. Although HL can be measured using tools such as Rapid Estimate of Adult Literacy in Medicine, health outcome indications are limited to survey results with few longitudinal studies, thereby providing a limited evidence-base of prolonged health outcomes [25].

Although populational HL level in the UK has not been gauged, a key HL observational study investigated the relationship between health materials and literacy abilities of the English working-age-population (16-65 years). Several healthcare professionals (HCPs), including dietitians, judged representativeness of a national health booklets sample and a threshold comprehension level was found to be level 2 (5 GCSE's A* to C), representing 73% of health brochures. When compared to populational literacy data from a survey

sample of 7230 people [26], 40% of participants were below the comprehension threshold [27]. Literacy competency multivariate analyses demonstrated that sex (Adjusted Odds Ratio (AOR) = 1.25), age (1.44), ethnicity (1.43), English as first language 2.03), qualification level (2.38), job grade (1.40 – 1.88), income (1.41) and home ownership (1.32) were statistically significant, whereas nativity (i.e. born/not born in UK) (AOR=1.07) and employment (i.e. employed/not employed) (AOR=1.05) were not significant [27]. It must be noted that these results were produced from a small sample, not accounting for verbal communication or individual's material interaction. The population data is somewhat dated and limited, neglecting non-working-age HL levels and did not include all HL aspects, like accessibility and comprehension. Nevertheless, the results underline a need for health literature to target lower HL levels.

Plain Language Summaries (PLSs)

A prevalent communication mode is written text, including journal articles, Plain Language Summaries (PLS), health information leaflets and Patient Information Leaflets, relating to pharmaceutical medicines. Journal articles communicate scientific research findings to similarly skilled professionals; the language is complex and discipline-specific preventing general public understanding. Therefore, PLSs of scientific findings are devised and are in widespread use, increasing science accessibility to those with lower HL. Although they have been criticised for formatting and length inconsistency, [28] they are nevertheless useful to communicate research



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Table 2: The evolving concept of health literacy: a selection of health literacy definitions in chronological order

Source and Year [Reference]	Definition
Nutbeam (1998) [11]	“The cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health.”
American Medical Association (AMA) (1999) [12]	“The constellation of skills, including the ability to perform basic reading and numeral tasks required to function in the healthcare environment.”
Nutbeam (2000) [13]	“The personal, cognitive and social skills which determine the ability of individuals to gain access to, understand, and use information to promote and maintain good health.”
Institute of Medicine (2004) [14]	“The individuals’ capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions.”
Zarcadoolas <i>et al.</i> (2005) [15]	“The wide range of skills, and competencies that people develop to seek out, comprehend, evaluate and use health information and concepts to make informed choices, reduce health risks and increase quality of life.”
Stocks <i>et al.</i> (2009) [16]	“The ability to understand and interpret the meaning of health information in written, spoken or digital form and how this motivates people to embrace or disregard actions relating to health.”
Freedman <i>et al.</i> (2009) [17]	“The degree to which individuals and groups can obtain, process, understand, evaluate, and act upon information needed to make public health decisions that benefit the community.”
Healthy People (2010) [18]	“The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”
Sørensen <i>et al.</i> (2012) [19]	“Health literacy is linked to literacy and entails people’s knowledge, motivation and competencies to access, understand, appraise and apply information to make judgements and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain and improve quality of life during the life course.”
Dodson <i>et al.</i> (2015) [20]	“The personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health. Health literacy includes the capacity to communicate, assert and enact these decisions.”

This table was adapted from [19, 21, 22].

findings. One example of innovation has been when a scientific or medical journal takes a positive action to also include a Lay or Plain Language Summary. One example of such practice is the Publication, *Cystic Fibrosis Research News*, which is a relative rarity in respiratory peer-review publishing, as it mirrors the papers published in its sister journal, the *Journal of Cystic Fibrosis* (JCF). *CF Research News* aims to foster enhanced knowledge by patients, their families and other members of the lay community about research advances published in JCF and to provide an opportunity for authors to write summaries of their Original Articles and Short Communications published in JCF.

Cochrane Reviews, provide vital, rigorous and reputable

evidence, however authors lack consistent adherence to the ‘Plain Language Expectations for Authors of Cochrane Summaries’ [29]. Points of author criticism are the continued technical jargon presence and only 23% of PLSs analysed being within the word count [30]. Locating PLSs online has also been highly criticised [31], highlighting the need for inter-discipline standardised practice.

The gold standard for assessing healthcare information readability is the Simple Measure of Gobbledygook [32] (Table 3). Various people such as original scientific authors, freelance writers and lay-people may be involved in writing a PLS. In most medical PLSs, the author writes corresponding PLS, helping thought continuity [31]. White and colleagues

piloted a second year undergraduate PLS writing course, with adherence criteria including a Flesh-Kincaid readability score of between grades 8 – 10 (age 13-16 years). Students described it as “tedious”, having difficulty in preserving integral research meaning whilst keeping reading level low [36]. Furthermore, Brownell and colleagues confirmed the need for university training to build SC into the curriculum, with multiple opportunities for practice, feedback and revision [37].

Visual Aids (VA)

Audio Visual (AV) techniques

Although little evidence has shown learning outcome differences based on a target learning styles teaching approach [41]; preferences may influence information delivery choice, whether visual, kinaesthetic or auditory. AV communication synthesises such preferences together forming videos. The effectiveness of healthcare AV communication has not been widely studied, although certain patient groups have indicated a desire for video-based education [42]. One area that has used AV Digital Communication (DC)

Table 3: A selection of the various metrics used to assess readability of written text

Readability Index Name	Summary	Score Example	Age equivalent	Formula
Simple Measure of Gobbledygook (SMOG)	Estimates comprehension in terms of years of education needed. The first, middle and last 10 sentences should be sampled to calculate SMOG. It involves counting words with 3+ syllables. [32]	SMOG US grade 8 score	13-14 years	$3 + \sqrt{\text{number of polysyllabic words} \times (30 \div \text{number of sentences})}$
The Gunning Fog Index (GFI)	Similar to SMOG except it estimates first time readability comprehension in terms of years of education needed. The scale is from 6-17. [33]	GFI US grade 7-8 score	13-14 years	$0.4 \times [(\text{words} \div \text{sentences}) + 100 \times (\text{complex words} \div \text{total words})]$
Flesch-Kincaid Grade Score (FKG)	Usually used in education and assesses readability whilst weighting heavily on syllable count. [34]	FKG US grade 8 score	13-14 years	$0.39 (\text{total words} / \text{total sentences}) + 11.8 (\text{total syllables} / \text{total words}) - 15.59$
Flesch Reading Ease Score (FRES)	English text on a scale of 100, with a higher number indicating easier comprehension. [35]	FRES score of 60-70	13 years	$[206.835 - (1.015 \times (\text{total words} \div \text{total sentences})) - (84.6 \times (\text{total syllables} \div \text{total words}))]$

VA found on posters, brochures, websites and social media can promote health messages and include pictures, infographics, figures, charts and pictographs. Results from a randomised study found that when presenting risk probability (e.g. 2/100), graphically for low literacy groups, pictographs were more effective for denominators <100-1000 and bar charts for >1000 [38]. Pictographs with text have been found to reduce error of drug dosage administration to children among parents with low HL [39]. Pictures improve information recall, grab attention and promote health information understanding; especially simpler cartoon pictures complementing text [41]. To maximise effectiveness, they should be accompanied by captions to prevent erroneous interpretation and illustrate written communication; not distracting from the information.

to promote health is for handwashing in infection control (IC). Particularly, Stanford University published a wordless AV graphic animation illustrating SARS-CoV-2 spread and preventative measures, which will form part of a randomised trial comparing differences in behavioural intent after watching it, compared to placebo and control [43]. Benefits of AV communication include its deliverability without physical contact and it can be re-watched and potentially inform without language barriers.

Digital Communication (DC)

There has been accelerated DC use to promote health messages with increasing telehealth replacing clinics. Previously HCPs have resisted engagement with some DC forms, e.g. social media, due to medicolegal and ethical



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

issues [44]. Valdez and colleagues have cautioned rapid DC acceptance by stating that the existent digital exclusion divide among many groups, but especially those with certain disabilities could exacerbate health access inequalities [45]. Common digital inclusion barriers found in a rapid review included; physical access, usage skills and fearful attitudes [46]. DC has significant reachability; however, barriers must be considered for long-term patient care, and HCP burden.

A specific DC ethical concern of the adolescent patient-clinician relationship is maintaining professionalism. Patients with chronic diseases felt that increased communication with HCPs produced a trusting relationship and better health knowledge, however, clinicians thought it blurred lines between consent and duty of care limits which were being stretched to out-of-office hours [47]. More guidance and clarity are necessary for HCPs effective navigation of digital health communication.

The importance of Health Literacy and Communication in Nutrition and Dietetics

The communication method and HL knowledge underpins effective nutrition and dietetic communication. One estimation of patient HL in primary care is the newest vital sign (NVS) measure, in which a clinician asks six comprehension questions from an ice-cream label, with the number of correct answers indicating likelihood of HL level [48]. In a study by Caldwell (2020) NVS scores indicated that adolescents' HL increased with age, suggesting HL intra-age-group variation [49]. Age and comprehension level will affect a dietitian's communication approach clinically and in devising written materials, with the target audience informing communication style, information and complexity.

The varied audience with which dietitians must effectively communicate outside a patient counselling role; (carers, families and HCPs within the multidisciplinary team (MDT)) promoted a pilot workplace-based communication programme for Australian dietitians. It was rated very beneficial for those practicing <5 years, indicating significantly higher benefit than those working >5 years, highlighting that reflective learning experiences improve communication [50]. Recent focus has been on the HL knowledge of students training as HCPs because of the potential teaching impact on shaping future clinician's communication skills. Results have been unequivocal, finding lower than desired HL and a need for student training in HL communication [51-53].

'Good communication skills' is also a theme associated with Dietetic patient centred care (PCC) [54]. Based on 27 reviewed studies, communication skills valued by patient and dietitian included verbal and non-verbal, such as active listening, rewording and asking questions. All modes focused on patients' value and promoted understanding and patient-enablement contributing to the overall "collaborative partnership" as a HL output. This aforementioned review focused only on patient-clinician relationships, neglecting other modes of dietetic communication, such as active enteral feeding demonstrations, DC or written materials.

CONCLUSION

In conclusion; without acknowledgement of the individual's HL level, abilities and access, dietetic communication will be sub-optimal. Verbal and active communications in patient-clinician relationships are important. Written SC is currently largely aimed at too high a reading and HL level, indicating the need for a standardised readability testing approach to evaluate healthcare material suitability. The addition of VA is helpful in communication for people with low HL and although there are gaps in the research regarding effectiveness of DC and target patient populations, prevalence is likely to increase. All communication approaches must be used selectively in PCC, in order to negotiate treatment plans, educate verbally, create resources to improve condition manageability and ultimately patient healthcare empowerment.

ACKNOWLEDGEMENTS

This project was a product of the Cystic Fibrosis Study Buddies Programme designed to enable improved health literacy and essential skills for life and employability in young CF adults. Author Hannah L. Anderson was a CF Study Buddy, supporting young people with cystic fibrosis. This project was supported by a Charitable Grant from Vertex Pharmaceuticals Inc., USA. (CG-2017-106614). Vertex Pharmaceuticals did not play any role in project conceptualisation, design, execution, analysis, nor any editorial role in manuscript writing or approval.

REFERENCES

1. Jucan MS, Jucan CN. The power of science communication. *Procedia Soc Behav Sci*. 2014;149:461-6. <https://doi.org/10.1016/j.sbspro.2014.08.288>
2. Orritt R, Powell P. Getting the word out: how to talk to the public about your research. *Breathe (Sheff)*. 2020;16(2):1-7.
3. Storr T, Maher J, Swanepoel E. Online nutrition information for pregnant women: a content analysis. *Matern Child Nutr*. 2017;13(2):e12315. doi: 10.1111/mcn.12315
4. Nutbeam D. Defining and measuring health literacy: what can we learn from literacy studies? *Int J Public Health*. 2009;54(5):303-5.
5. Neter E, Brainin E. Association between health literacy, ehealth literacy, and health outcomes among patients with long-term conditions. [Internet]. *Eur Psychol*. 2019;24(1):68-81.
6. DeWalt DA, Brouckson KA, Hawk V, Brach C, Hink A, *et al*. Developing and testing the health literacy universal precautions toolkit. *Nurs Outlook*. 2011;59(2):85-94.
7. NHS Digital Service Manual. [Internet]. Content Style Guide: Health literacy. [cited 2021 Dec 7]. Available from: <https://service-manual.nhs.uk/content/health-literacy>.
8. NHS Health Education England. [Internet]. Health literacy "how to" guide. [cited 2021 Dec 7]. Available from: <https://library.nhs.uk/wp-content/uploads/sites/4/2020/08/Health-literacy-how-to-guide.pdf>.
9. Mantzioris E. The science and art of dietetics: why science needs to underpin our practice. *Nutr Diet*. 2018;75(3):247-9.
10. Frisch AL, Camerini L, Diviani N, Schulz PJ. Defining and measuring health literacy: how can we profit from other literacy domains? *Health Promot Int*. 2012;27(1):117-26.
11. Nutbeam D, Kickbusch I. Health promotion glossary. *Health Promot*



- Int.* 1998;13(4):349-64.
12. Health literacy: report of the council on scientific affairs. Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs American Medical Association. *JAMA*. 1999;281(6):552-7.
 13. Nutbeam D. Health literacy as a public goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int.* 2000;15(3):259-67.
 14. Institute of Medicine (US) Committee on Health Literacy. Health literacy: a prescription to end confusion. Washington (DC): National Academies Press; 2004.
 15. Zarcadoolas C, Pleasant A, Greer DS. Understanding health literacy: an expanded model. *Health Promot Int.* 2005;20(2):195-203.
 16. Adams RJ, Stocks NP, Wilson DH, Hill CL, Gravier S, Kickbusch L, et al. Health literacy - a new concept for general practice? *Aust Fam Physician*. 2009;38(3):144-6.
 17. Freedman DA, Bess KD, Tucker HA, Boyd DL, Tuchman AM, Wallston KA. Public health literacy defined. *Am J Prev Med*. 2009;36(5):446-51.
 18. U.S. Department of Health and Human Services. Healthy People 2010 Understanding and improving health. 2nd ed. Washington, [DC]: Department of Health and Human Services, National Networks of Libraries of Medicine; 2010.
 19. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*. 2012;12(1):80. doi: 10.1186/1471-2458-12-80.
 20. Dodson S, Good S, Osborne R. [Internet]. Health literacy toolkit for low and of middle-income countries: a series of information sheets to empower communities and strengthen health systems. New Delhi: World Health Organization; 2015 [cited 2020 Dec 5]. Available from: <https://apps.who.int/iris/bitstream/handle/10665/205244/B5148.pdf?sequence=1&isAllowed=y>
 21. Berkman ND, Davis TC, McCormack L. Health literacy: what is it? *J Health Commun*. 2010;15(Suppl 2):9-19.
 22. Okan O, Bauer U, Levin-Zamir D, Pinheiro P, Sørensen K. International handbook of health literacy: research, practice and policy across the lifespan. Bristol: Policy Press; 2019 [cited 2020 Dec 5]. Available from: <https://library.open.org/handle/20.500.12657/24879>.
 23. Parnell TA, Stichler JF, Barton AJ, Loan LA, Boyle DK, Allen PE. A concept analysis of health literacy. *Nurs Forum*. 2019;54(3):315-27.
 24. Bailey SC, Brega AG, Crutchfield TM, Elasy T, Herr H, Kaphingst K, Karter AJ, et al. Update on health literacy and diabetes. *Diabetes Educ*. 2014;40(5):581-604.
 25. Pignone M, DeWalt DA, Sheridan S, Berkman N, Lohr KN. Interventions to improve health outcomes for patients with low literacy: a systematic review. *J Gen Intern Med*. 2005;20(2):185-92.
 26. Department for Business Innovation and Skills. The 2011 skills for life survey: a survey of literacy, numeracy and ICT levels in England. BIS Research Paper Number 81. London: Business Innovation & Skills; 2012 [cited 2020 Dec 5]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/36000/12-p168-2011-skills-for-life-survey.pdf
 27. Rowlands G, Protheroe J, Winkley J, Richardson M, Seed PT, Rudd R. A mismatch between population health literacy and the complexity of health information: an observational study. *Br J Gen Pract*. 2015;65(635):e379-e386. doi: 10.3399/bjgp15X685285.
 28. Shailes S. Plain language summaries of research, something for everyone. [Internet]. *ELife*. 2017;6:e25411. doi: 10.7554/eLife.25411. Available from: <https://elifesciences.org/articles/25411>
 29. Chanler J, Churchill R, Higgins J, Lasserson T, Tovey D. Methodological expectations of cochrane intervention reviews (MECIR). Methodological standards for the conduct of new Cochrane Intervention Reviews. version 2013;2. London: The Cochrane Collaboration; 2013. Available from: https://consumers.cochrane.org/sites/consumers.cochrane.org/files/public/uploads/pleacs_2019.pdf
 30. Kadic AJ, Fidahic M, Vujcic M, Saric F, Propadalo I, Marelja I, et al. Cochrane plain language summaries are highly heterogeneous with low adherence to the standards. *BMC Med Res Methodol*. 2016;16(61). <https://doi.org/10.1186/s12874-016-0162-y>.
 31. FitzGibbon H, King K, Piano C, Wilk C, Gaskarth M. Where are biomedical research plain-language summaries? *Health Sci Rep*. 2020;10(3):e175. <https://doi.org/10.1002/hsr2.175>
 32. Fitzsimmons PR, Michael BD, Hulley JL, Scott GO. A readability assessment of online Parkinson's disease information. *JR Coll Physicians Edinb*. 2010;40(4):292-6.
 33. Keogh CJ, McHugh SM, Moloney M, Hannigan A, Healy DA, Burke PE, et al. Assessing the quality of online information for patients with carotid disease. *Int J Surg*. 2014;12(3):205-8.
 34. Worrall AP, Connolly MJ, O'Neill A, O'Doherty M, Thornton KP, McNally C, et al. Readability of online COVID-19 health information: a comparison between four English speaking countries. *BMC Public Health*. 2020;20(1):1-12.
 35. Hansberry DR, Agarwal N, Baker SR. Health literacy and online educational resources: an opportunity to educate patients. *AJR Am J Roentgenol*. 2015;204(1):111-6.
 36. White WB, Nelson CR, Henderson FC. Developing lay summaries as a bidirectional learning opportunity for authors and undergraduate scholars: the Jackson heart study. *Pedagogy Health Promot*. 2019;6(2):137-41.
 37. Brownell SE, Price JV, Steinman L. Science communication to the general public: why we need to teach undergraduate and graduate students this skill as part of their formal scientific training. *J Undergrad Neurosci Educ*. 2013;12(1):e6-e10. PMID: 24319399
 38. McCaffery KJ, Dixon A, Hayen A, Jansen J, Smith S, Simpson JM. The influence of Graphic Display Format on the interpretations of quantitative risk information among adults with lower education and literacy: a randomized experimental study. *Med Decis Making*. 2011;31(4):532-44.
 39. Yin HS, Mendelsohn AL, Fierman A, van Schaick L, Bazan IS, Dreyer BP. Use of a pictographic diagram to decrease parent dosing errors with infant acetaminophen: a health literacy perspective. *Acad Pediatr*. 2011;11(1):50-7.
 40. Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Educ Couns*. 2006;61(2):173-90.
 41. Kirschner PA. Stop propagating the learning styles myth. *Comput Educ*. 2017;106:166-71.
 42. Cooley L, Hudson J, Potter E, Raymond KF, George C, Georgiopoulos AM. Clinical communication preferences in Cystic Fibrosis and strategies to optimize care. *Pediatr Pulmonol*. 2020;55(4):948-58.
 43. Vandormael A, Adam M, Greuel M, Bärnighausen T. A short, animated video to improve good COVID-19 hygiene practices: a structured summary of a study protocol for a randomized controlled trial. *Trials*. 2020;21(1):469. doi: 10.1186/s13063-020-04449-1.
 44. George DR, Rovniak LS, Kraschnewski JL. Dangers and opportunities for social media in medicine. *Clin Obstet Gynecol*. 2013;56(3):453-62.
 45. Valdez RS, Rogers CC, Claypool H, Trieshmann L, Frye O, Wellbeloved-Stone C, et al. Ensuring full participation of people with disabilities in an era of telehealth. *J Am Med Inform Assoc*. 2020;28(2):389-92.
 46. Borg K, Boulet M, Smith L, Bragge P. Digital inclusion and health communication: a rapid review of literature. *Health Commun*.



2019;34(11):1320-28.

47. Ignatowicz A, Slowther AM, Elder P, Bryce C, Hamilton K, Huxley C, *et al.* Ethical implications of digital communication for the patient-clinician relationship: analysis of interviews with clinicians and young adults with long term conditions (the LYNC study). *BMC Med Ethics*. 2018;19(1):11. doi: 10.1186/s12910-018-0250-0.
48. Shealy KM, Threatt TB. Utilization of the newest vital sign (NVS) in practice in the United States. *J Health Commun*. 2015;31(6):679-87.
49. Caldwell EP. Health literacy in adolescents with sickle cell disease: the influence of caregiver health literacy. *J Spec Pediatr Nurs*. 2019;25(2):e12284. <https://doi.org/10.1111/jspn.12284>
50. Notaras S, Mak M, Wilson N. Advancing practice in dietitians' communication and nutrition counselling skills: a workplace education program. *J Hum Nutr Diet*. 2018;31(6):725-33.
51. Mullan J, Burns P, Weston K, McLennan P, Rich W, Crowther S, *et al.* Health literacy amongst health professional university students: a study using the health literacy questionnaire. *Educ Sci*. 2017;7(2):54-65.
52. Rueda-Medina B, Gómez-Urquiza JL, Tapia-Haro R, Casas-Barragán A, Aguilar-Ferrández ME, Correa-Rodríguez M. Assessing health science students' health literacy and its association with health behaviours. *Health Soc Care Community*. 2020;28(6):2134-9.
53. Uysal N, Ceylan E, Koç A. Health literacy level and influencing factors in university students. *Health Soc Care Community*. 2019;28(2):505-11.
54. Sladdin I, Ball L, Bull C, Chaboyer W. Patient-centred care to improve dietetic practice: an integrative review. *J Hum Nutr Diet*. 2017;30(4):453-70



Case Report

Tuberculosis Aortitis and Mycotic Pseudo-aneurysm of the Infra-renal Aorta after Intravesicular BCG Therapy

Nathan Gamble¹, Robert Blair¹, Sam Gray², Michael Hunter³, Denis Harkin¹

ABSTRACT

We report a patient who presented with a rapidly expanding symptomatic tuberculous aortitis and mycotic pseudo-aneurysm of the infra-renal aorta, after intra-vesical BCG chemotherapy for bladder cancer, treated by required emergency open aneurysm repair. His case highlights this rare complication of intravesicular BCG treatment, haematological seeding causing tuberculous aortitis and mycotic pseudo-aneurysm formation of the infra-renal aorta. It also illustrates successful treatment with emergency open surgery, local debridement of mycotic pseudoaneurysm, in-situ surgical reconstruction using a custom bovine-wrap interposition graft to create a neo-aorta and multi-agent anti-tuberculous chemotherapy.

CASE REPORT

A 65-year-old man presented to the Emergency Department with a six-week history of generalised lower abdominal pain radiating posteriorly to his sacroiliac joint. He had past history of bladder cancer (grade 2 pT1 transitional cell carcinoma) and had undergone planned curative Trans-Urethral Resection Bladder Tumour (TURBT) surgery with adjuvant intravesicular BCG treatment, receiving 2 cycles of treatment over the last year. A recognised but rare complication of intravesicular BCG treatment is the development of Iatrogenic Tuberculosis (TB).

CT Abdomen and Pelvis with contrast was performed in the Emergency Department on the day of presentation which showed a large thick-walled saccular pseudo-aneurysm of the distal infra-renal abdominal aorta with the radiological appearances consistent with a mycotic pseudo-aneurysm with signs of impending rupture. The clinical working diagnosis was of tuberculous aortitis and mycotic pseudo-aneurysm formation of the infra-renal aorta. Within 18 hours, the patient underwent emergency open surgery, with local debridement of mycotic pseudoaneurysm and para-aortic tissue and in-situ surgical reconstruction using a custom bovine-pericardial-wrap interposition tube-graft to create a neo-aorta (Figure 2.), with no intra-operative complications. Aortic tissue and fluid samples were taken intra-operatively and sent for microbiological investigations. The patient was treated in conjunction with an infectious diseases specialist with initially empirical antibiotic therapy.



Figure 1. CT Abdomen and Pelvis with contrast was performed in the Emergency department which showed a large thick-walled saccular pseudo-aneurysm of the distal infra-renal abdominal aorta with the radiological appearances consistent with a mycotic pseudo-aneurysm. Signs of impending rupture were evident from a concerning defect in the anterior wall of the aorta, alongside localised reactive changes in peri-aortic fat stranding and para-aortic lymphadenopathy.

Microbiology results from both blood culture samples, and intra-operative samples confirmed Tuberculosis (TB) with acid-fast bacilli seen on tissue sample processing. The Infectious Diseases specialist treated the patient by commencing the combination chemotherapy regime; Voractiv (Rifampicin, Isoniazid, Pyrazinamide and Ethambutol) and

¹Vascular Surgical Unit, Royal Victoria Hospital, Belfast, UK

²Urology Unit, Ulster Hospital Dundonald, UK

³Infectious Diseases Unit, Royal Victoria Hospital, Belfast, UK

Correspondence to: Nathan Gamble

Email: ngamble04@qub.ac.uk



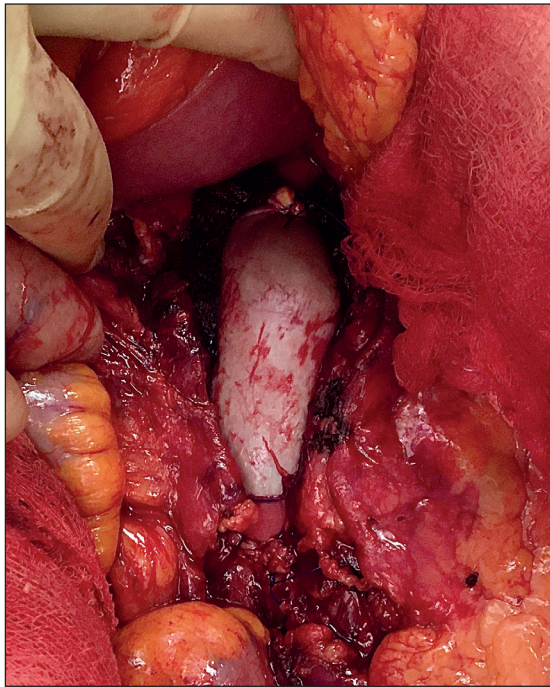


Figure 2. Intra-operative view of retroperitoneum, after local debridement of mycotic pseudoaneurysm and para-aortic tissue, showing in-situ surgical reconstruction using a custom bovine-pericardial-wrap interposition tube-graft to create a neo-aorta.

the patient made an uncomplicated recovery from surgery and was discharged home following a 17 day stay in hospital.

DISCUSSION

Currently, for high risk, non-muscle-invasive bladder cancers (NMIBC), defined by NICE Guidance¹ following a transurethral resection of a bladder tumour (TURBT), patients are offered the choice of intra-vesicular BCG therapy² or a radical cystectomy. In this case, the patient opted for intra-vesicular BCG therapy. In addition to the BCG therapy, the patient received a single dose of mitomycin C, given within 24 hours of resection, which is standard practice of care and reduces recurrence risk by 40-50% with a very low incidence of adverse events³. BCG therapy reduces the likelihood of recurrence and progression of bladder tumours that have been managed with transurethral resection⁴. It is thought the anti-tumour effect of BCG therapy results from a T-cell mediated inflammatory reaction. Commonly, following this therapy, patients can experience symptoms such as dysuria, increased urinary frequency and fevers.

The incidence of mycotic aortic aneurysms is rare, with 0.9%-1.3% of aneurysms resulting from an infective cause⁵. The most commonly associated pathogens are *Staphylococcus Aureus* (most common), *Streptococcus* spp., *Salmonella* and *Escherichia coli*. The incidence of mycotic aneurysms as a result of intra-vesicular BCG therapy is therefore very rare indeed, upon review of the published literature, we found a total of only 35 cases dating back to 1988, including this patient. The interval between final instillation and first

presentation of infection in our patient was just over a year which compared to similar cases is a relatively short duration – the median of these cases being 17 months⁶.

Our patient's only presenting symptom was abdominal discomfort for a period of 6 weeks, they did report weight loss but stated this was intentional. The most common presenting symptoms for mycotic aneurysms are pain, 79%, and fever, 48%, and whilst pain was a major feature in our case, fever was not reported, and the patient was afebrile on admission.

It is thought that there are a number of ways that the causative Tuberculous Bacilli can reach the aortic wall in order to cause the initial infection and aortitis. A risk factor for complications of BCG therapy is commencing the treatment temporally close to the surgical bladder wall trauma after TURBT. It is widely recommended that BCG therapy should not start for several weeks following procedures that could damage the bladder and grant bacteria access to the blood stream⁷. Once bacilli are in the blood stream, and are haematologically spread, they may infect the aorta by entering through damage to the vessel wall secondary to atherosclerosis, or through the vasa vasorum and invading the adventitia or media. Alternatively, the bacilli can infect the vessel by means of a contiguous focus such as a lymph node or paraspinal abscess⁸.

Other than positive blood cultures and aortic tissue taken intra-operatively which grew acid-fast bacilli, there was no evidence of systemic TB in this case. Treatment by open surgery remains the gold-standard for mycotic pseudoaneurysm of the infra-renal aorta, as it offers an opportunity for surgical debridement of infected tissue and tissue sampling for microbiology assessment with confirmation of the diagnosis. Where possible anatomical in-situ reconstruction of the aorta is preferred, using autologous vein or as in this case, a custom bovine-pericardium-wrap fashioned into a tube-graft, which is remarkably versatile and resistant to infection. When in-situ reconstruction is not feasible, an alternative approach is aortic ligation and extra-anatomic bypass by axillo-bi-femoral bypass grafting. Endovascular Repair with an Endograft Covered-Stent can offer a temporary solution, particularly in extremis or ruptured aneurysms, but infection typically persists and despite long-term antimicrobial therapy, the majority suffer late infective complications and death.

This case highlights a rare complication of intravesicular BCG therapy for Bladder Cancer with the development of a life-threatening Tuberculous aortitis and rapidly expanding pseudoaneurysm of the infra-renal abdominal aorta. Untreated rupture and death would have resulted, but we are pleased to report that after open surgical repair and adjuvant combination anti-tuberculous chemotherapy this man made an uncomplicated recovery. It is important for clinicians to consider the possibility of a mycotic aneurysm in patients with a history of bladder cancer managed with BCG therapy. This allows the conduction of relevant

microbiological investigations so that positive diagnoses can facilitate emergency surgical treatment to be complimented by targeted anti-microbial therapy for a successful outcome.

REFERENCES

1. NICE Guideline; 2. Bladder cancer: diagnosis and management, London: National Institute for Health and Care Excellence; 2015. Available from: <https://www.nice.org.uk/guidance/NG2>
2. Porten SP, Leapman MS, Greene KL. Intravesical chemotherapy in non-muscle-invasive bladder cancer. *Indian J Urol.* 2015;31(4):297-303.
3. Mostafid H. NICE Guidance: Conditions and diseases: cancer: bladder cancer. Immediate instillation of intravesical chemotherapy (Mitomycin-C) following transurethral resection for bladder tumour. [View the supporting material.] [monograph on the Internet]. London: NICE Shared Learning Database; 2015. [cited 2021 Jan 7]. Available from: <https://www.nice.org.uk/sharedlearning/immediate-instillation-of-intravesical-chemotherapy-mitomycin-c-following-transurethral-resection-for-bladder-tumour>
4. Shelley M, Court JB, Kynaston H, Wilt TJ, Fish R, Mason M. Intravesical Bacillus Calmette-Guérin in Ta and T1 bladder cancer. *Cochrane Database Systematic Reviews*; 2000. Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD001986/full>.
5. Muller BT, Wegener OR, Grabitz K, Pillny M, Thomas L, Sandmann W. Mycotic aneurysms of the thoracic and abdominal aorta and iliac arteries: experience with anatomic and extra-anatomic repair in 33 cases. *J Vasc Surg.* 2001; 33(1):106-13.
6. Higashi Y, Nakamura S, Kidani K, et al. Mycobacterium bovis-induced Aneurysm after Intravesical Bacillus Calmette-Guérin therapy: a case study and literature review. *Intern Med.* 2018;57(3):429-35.
7. Steg A, Adjiman S, Debre B. BCG therapy in superficial bladder tumours – complications and precautions. *Eur Urol.* 1992; 21(Suppl 2): 35-40.
8. Long R, Guzman R, Greenberg H, Safneck J, Hershfield E. Tuberculous mycotic aneurysm of the aorta: review of published medical and surgical experience. *Chest.* 1999; 115(2): 522-31.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>). The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Clinical Paper

Metastasis of Renal Cell Carcinoma to the Stomach Twenty One Years from Initial Diagnosis

Stuart McIlwaine,¹ Mark Haynes,² Neal Morgan,³ Rajeev Shah,⁴ James Doyle⁵

ABSTRACT

A female in her 80's presented to our Emergency Department following a fall. She reported general malaise, weight loss and raised inflammatory markers. Background included renal cell carcinoma 21 years previous, managed with radical nephrectomy. During her inpatient stay she had an episode of haematemesis. Upper GI endoscopy revealed a 3cm polypoidal lesion on the greater curve of the upper stomach. This had an irregular pit pattern endoscopically and was friable. Multiple biopsies revealed metastatic clear cell carcinoma of renal origin; the same sub-type as her previous renal tumour. This is a rare manifestation of metastatic renal cell carcinoma and from literature review, is only the 2nd case we can find with a lag time of >20 years from the initial diagnosis to presenting with metastatic gastric disease.

Keywords: Gastric Disease, Gastrointestinal Bleeding

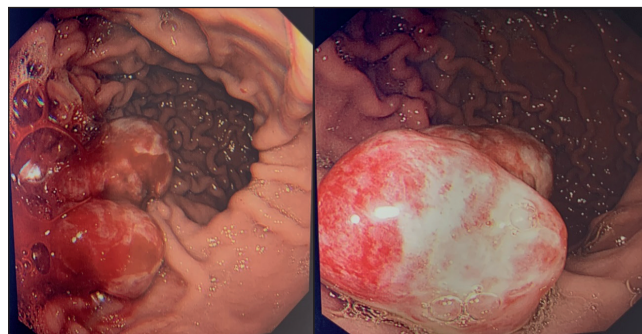
CASE REPORT

A female patient in her 80's was admitted to hospital following a fall, with general malaise, weight loss and raised inflammatory markers. She was commenced on broad-spectrum antimicrobial therapy. A CT A/P revealed no evidence of any intra-abdominal sepsis.

In 1999 she underwent radical left sided total nephrectomy for Renal Cell Carcinoma (RCC). The histopathology confirmed clear cell renal cell carcinoma showing nested aggregates of cells with abundant clear finely granular cytoplasm and areas showing tubular differentiation. Images of these slides were unfortunately not obtainable. Her background co-morbidities include.

- Previous Renal Cell Carcinoma (as mentioned above).
- Atrial fibrillation on Warfarin
- End stage renal disease of multifactorial origin managed on peritoneal dialysis
- Hypertension
- Hypothyroidism

During the admission she suffered an acute episode of haematemesis. An OGD revealed a friable 3cm polypoidal lesion on the greater curve (Figures 1 and 2) with an irregular pit pattern. Multiple biopsies were obtained revealing nests of tumour cells with clear cytoplasm and stained positive for PAX 8, AE1/AE3 and EMA. The morphological and



Figures 1 and 2 Polypoidal lesion on greater curve

immunohistochemical features were entirely in keeping with metastatic clear cell adenocarcinoma of renal origin, notably the same cellular subtype as her previous RCC. (Figures 3,4,5, and 6).

A staging CT chest showed bilateral pulmonary lesions consistent with metastatic disease. The CT abdomen and pelvis done just after admission showed the remaining kidney to be slightly atrophic with simple cysts, but no new primary site identified. In 2015 two small pulmonary nodules had been detected incidentally during a CT pulmonary angiogram study. These lesions were not biopsied but followed up by serial CT PET and CT imaging. They had changed minimally in size over a 5 year surveillance period and may well have represented foci of pulmonary metastatic disease. Our patient did not wish for further investigation or consideration of therapy and she was discharged from hospital with her family.

DISCUSSION

Renal cell carcinoma is the seventh most common cancer in the UK, with Clear Cell Carcinoma accounting for more than 80% of these cases¹. Multiple risk factors are

¹ Core Medical Trainee, Daisy Hill Hospital

² Consultant Urologist, Daisy Hill Hospital

³ Consultant Nephrologist, Daisy Hill Hospital

⁴ Consultant Pathologist, Craigavon Area Hospital

⁵ Consultant Gastroenterologist, Daisy Hill

Correspondence to: James Doyle
Daisy Hill Hospital,
Southern Health and
Social Care Trust,
Newry, UK

Email: James.Doyle@southerntrust.hscni.net

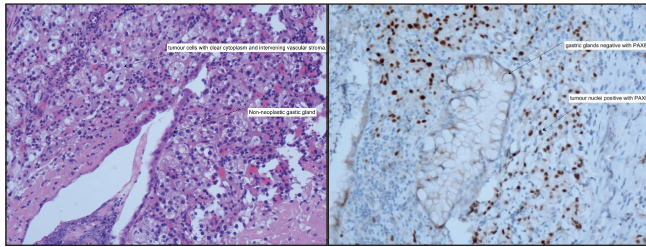


Figure 3 – H&E stain

Figure 4 – Positive PAX 8 Immunostain

associated, including increased age, obesity, smoking, long-term dialysis and exposure to compounds including asbestos, cadmium or petroleum products. Genetic syndromes are also involved such as von Hippel-Lindau and tuberous sclerosis¹. Recurrence is common after nephrectomy with 60% of patients suffering distant relapse within 5 years of surgical intervention². Leibovich scoring has been utilized in Clear Cell Renal Carcinoma to predict the risk of disease progression following radical nephrectomy. It classifies patients into low, medium or high risk based on the clinical and pathological features present at the time of nephrectomy, and estimates metastasis free survival in years. Low risk cases have a mean metastasis-free survival of 7.4 years vs high risk at 1.7 years³. Clear Cell Renal Carcinoma is thought to spread by lymphatic, hematogenous, transcoelomic routes, or through direct invasion⁴.

Gastric Metastases are relatively rare findings shown by autopsy cases with solid malignancies. Oda et al, found that Gastric metastatic lesions were present in 5.4% of patients: with lung, breast, and oesophagus being the most common primary sites. Renal Cell Carcinoma metastasised to the stomach in 6.2% of cases⁵.

Specifically in relation to RCC one review reported the average age at presentation of gastric metastases is 59.1 years with an extensive lag period before metastasis averaging 7 years (range 0-20 years) since the diagnosis of the primary RCC. The interval in our patient was 21 years. From our literature review this is nearly the longest ever

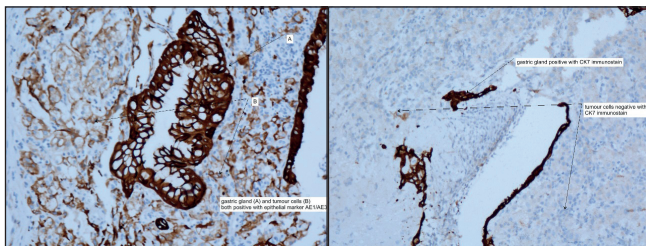


Figure 5 – Positive AE1/ AE3 Immunostain

Figure 6 – Negative CK7 Immunostain

reported interval between RCC diagnosis and discovery of gastric metastatic disease, only surpassed by a single report of a case 23 years after initial RCC diagnosis^{6,7,8}. This shows the importance of considering all possible diagnoses with histopathology sampling when endoscopic findings are similar to that of a primary gastric malignancy.

It is important to recognise that the most common presenting signs associated with gastric metastasis from RCC are upper gastrointestinal bleeding and iron deficient anaemia. The most common site of lesion is reported as the gastric body and more likely to be a solitary mass or ulcer. These findings are in keeping with our case⁹.

This case highlights a few key points.

1. It is important to be vigilant when performing diagnostic endoscopy and consider appropriate differential diagnoses of any findings that may prompt further investigation. Renal cell carcinoma metastases are typically vascular and whilst histologic diagnosis is most valuable, biopsy must be undertaken with care. In the event of haemorrhage, embolisation has been cited as first line management for these gastrointestinal sites due to vascular supply¹⁰.
2. Metastatic malignancy (in this case from RCC) is an uncommon finding during endoscopy but is an important diagnosis to be made. Renal cell carcinoma can recur late - up to 23 years after initial remission from primary disease.

REFERENCES

1. Cancer Research UK . Kidney cancer statistics. [monograph on the Internet]. Oxford: Cancer Research UK. [Cited: 2020 Jul 31]. Available from: <https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/kidney-cancer#heading-Zero>.
2. Janzen NK, Kim HL, Figlin RA, Beldegrun AS. Surveillance after radical or partial nephrectomy for localized renal cell carcinoma and management of recurrent disease. *Urol Clin North Am*. 2003;30(4):843–52
3. Leibovich BC, Blute ML, Cheville JC, Lohse CM, Frank I, Kwon ED, et al. Prediction of progression after radical nephrectomy for patients with clear cell renal cell carcinoma: a stratification tool for prospective clinical trials. *Cancer*. 2003;97(7):1663–71.
4. Tiwari P, Tiwari A, Vijay M, Kumar S, Kundu AK. Upper gastrointestinal bleeding - Rare presentation of renal cell carcinoma. *Urol Ann*. 2010;2(3):127–9
5. Oda I, Kondo H, Yamao T, Saito D, Ono H, Gotoda T, et al. Metastatic tumors to the stomach: analysis of 54 patients diagnosed at endoscopy and 347 autopsy cases. *Endoscopy*. 2001;33(6):507–10.
6. Onorati M, Petracco G, Ubaldi P, Redaelli DG, Romagnoli S, Albertoni M, et al. A solitary polypoid gastric metastasis 20 years after renal cell carcinoma: an event to be considered, and a brief review of the literature. *Pathologica*. 2013;5(4):132–6.
7. Kim MY, Jung HY, Choi KD, Song HJ, Lee JH, Kim DH, et al. Solitary synchronous metastatic gastric cancer arising from T1b renal cell carcinoma: a case report and systematic review. *Gut Liver*. 2012;6(3):388–94.
8. Namikawa T, Iwabu J, Kitagawa H et al. Solitary gastric metastasis from a renal cell carcinoma, presenting 23 years after radical nephrectomy. *Endoscopy*. 2012;44 Suppl 2 UCTN:e177–8. doi: 10.1055/s-0031-1291751.
9. Xu J, Latif S, Wei S. Metastatic renal cell carcinoma presenting as gastric polyps: a case report and review of the literature. *Int J Surg Case Rep*. 2012;3(12):601–4.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

10. Ohmura Y, Ohta T, Doihara H, Shimizu N. Local recurrence of renal cell carcinoma causing massive gastrointestinal bleeding: a report of two patients who underwent surgical resection. *Jpn J of Clin Oncol.* 2000;30(5):241-5



A Golden age and the Floating Man: Ireland, Avicenna and the Canon of Medicine.

Delivered 27th November 2018

Barry Kelly

It is both an honour and a privilege to have been invited by your president, Dr Peter Watson, to give this eponymous lecture. I had the great fortune to meet Colonel Whyte on this very site, several years ago. Although retired, he retained an encyclopaedic knowledge and had a sharp enquiring mind. I clearly recall that he discussed in considerable detail, the emerging decoding of the genome and the advent of stratified medicine.



Figure 1. Avicenna

Tonight, I would like to speak to you about another polymath, lamentably under recognised in contemporary western medicine; the scholar known to us as Avicenna. (Figure 1. Avicenna)

A philosopher and physician, he is the preeminent exemplar of those who created the Golden Age of Islamic Science, between the 7th and 11th centuries CE. Their dedication to truth, science and knowledge, regardless of their sources; and their fastidiousness for record keeping, connects us with antiquity. Without them, much if not all of it would be lost to us. As you will hear, Ireland played its crucial part, confirming as Andrew Marr has stated in his *History of the World* that 'History is often made at the margins.'

The story I would like to recount tonight spans approximately 1,000 years and extends from our rugged Western coastline across the world to The Persian Empire. My narrative isn't linear, but to weave the story's threads into shape, I must oscillate, hither and thither in time and place. We shall consider two disparate first-millennial cultures at the margins: one to the East and one, West. Neither had been influenced by the prevailing culture at the centre. Neither had been dominated by its greatest city: Rome.

The Roman Empire was the greatest empire the world had ever known. For centuries, it had provided stability, prosperity, and technological advance. Within its mighty -and seemingly impregnable- borders, there had been peace. In 407 CE, the

unthinkable happened. Germanic tribes defeated the Roman army and crossed the Rhine. Their objective was Rome. In 410 CE, Alaric the Goth sacked it. Arriving at the gates of Rome, empty threats from the Roman envoys were ignored. He warned "I will take all your gold, your silver, your slaves and everything that is precious to you." The startled envoys then asked, "But what will that leave us with?" "Your lives," replied Alaric.

So, Rome fell. With its demise, the Pax Romana ended. Order was replaced with chaos. Civilisation as it had existed, was gone. It had become, as William Manchester wrote, 'A World Lit Only by Fire'. But it wasn't *the world*. That's a Eurocentric view. Elsewhere, two other civilisations were flowering. Neither was aware of the other's existence. From one would emanate The Golden Age of Islamic Science.

Persia and the Caliphate.

The Abbasid caliphate was the second of the Muslim Empire's two great dynasties. (Figure 2. *The Abbasid Caliphate*) The first, the Umayyad Caliphate had been overthrown by the



Figure 2. The Abbasid Caliphate

Abbasids in 750 CE and the Abbasid caliphate itself would ultimately be destroyed with the Mongol invasion of 1258 CE. The local Samanid Dynasty had been Persian converts to Islam. They were tolerant of other sects and religions. They reinstated Persian as the court language, promoted poets, writers and philosophers. Above all they collected books. The Gestational Theory attests that Islam kept all the great books of antiquity, having borrowed, copied and translated them in their Houses of Wisdom and facilitating their eventual journey into Europe when it had been reborn with its 14th century Renaissance. They certainly did that but that's just the beginning of our, and their, story.



The Falasifa

The *Falasifa* (philosophers) of the Golden Age form the nucleus of this segment of my story. For them, earlier civilisations such as the Babylonian, Egyptian and Greek were simply a continuum. They were greatly influenced by the wisdom of what they called 'The Ancients', or 'The First Ones' (*Al-Awail*) principally Plato and Aristotle. (Figure 3a. Plato. Figure 3b. Aristotle)

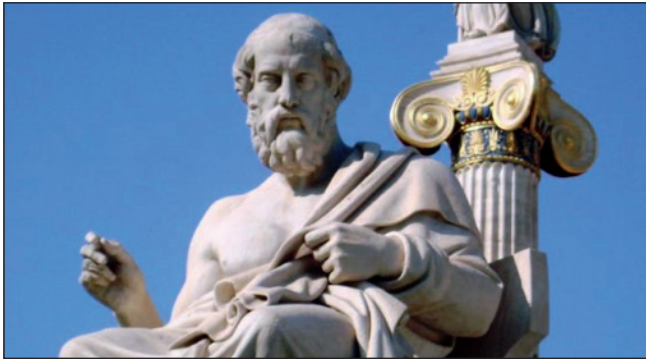


Figure 3a. Plato.



Figure 3b. Aristotle

Let's now consider some of The Golden Age's greatest luminaries. I have taken the liberty of using abbreviated versions of their names. I have attempted, where possible, to maintain chronological order. I have also limited the listing of their achievements to what are considered their greatest contributions to the world.

Al-Farazi (746 -796 CE) was a philosopher, astronomer and mathematician who built the first astrolabe and translated the Indian mathematician Brahmagupta's book, the *Brahmasphutasiddhanta*, thereby introducing 'Indian Numerals' (The Decimal System) to the Islamic world and eventually to Europe. Al-Khwarizmi (780 -850 CE) was a mathematician, astronomer and cartographer. (Figure 4. Al Khwarizmi). He was the head of Baghdad's House of Wisdom and was known as The Father of Algebra. One of his books was entitled *Kitab-al-Jabr* (*The Book of Calculation*), from which we get our word, algebra. Another book of his, *The Compendious Book on Calculation by Completion and Balancing* (*Kitab al-Jabr wa-l-Muqabala*) was studied in Europe until the 16th century. His work, *On The Calculation With Hindu*



Figure 4. Al Khwarizmi

Numerals helped spread the adoption of a decimal system throughout the Middle East and Europe. Among his other achievements, he measured the circumference of the earth accurately and calculated it, correctly, to be 23,200 miles. His name was latinised to Algorithmi, from which we get the word, algorithm.

Al-Kindi (801-873 CE) was the Father of Arabic Philosophy. A true polymath, he studied medicine, pharmacology, metaphysics, ethics, psychology, logic, mathematics, astronomy, music, meteorology and geology. It is estimated that he wrote 260 books, of which 30 were medical texts. He also made huge developments in the fields of optics and cryptography. Al-Farabi (872 -950 CE) was a philosopher, jurist, scientist, cosmologist, mathematician and music scholar. He was an accomplished metaphysician in the tradition of Plato and Aristotle. In the Islamic tradition he is known as The Second Teacher, after Plato who was considered The First Teacher. Al-Zahrawi (936 -1013 CE)

was considered The Father of Surgery. He was the first to use Kocher's method to reduce a dislocated shoulder; posited a hereditary explanation for haemophilia and ligated blood vessels six centuries before Ambrose Paré. Al-Zahrawi wrote a thirty-volume medical encyclopaedia; designed over 200 surgical instruments including scalpels, retractors, curettes, pincers and specula and introduced catgut for internal suturing. He discovered that it was soluble when his pet monkey ate the strings of his oud!

Primus inter pares was Avicenna. Abū-Alī al-Ḥusayn ibn-ʿAbdallāh Ibn-Sīnā (Avicenna) was born in 980 CE in Afshana, Uzbekistan; a region controlled by the local Samanid dynasty within the enormous Abbasid caliphate and was the foremost Islamic physician and philosopher of The Golden Age. His immense contributions to both disciplines would stretch far into the future. Before we consider him in detail, we must make a detour, West.

Europe after the fall of the Roman Empire

Meanwhile, what became of Europe? The order that had been imposed by Rome was gone and had been replaced by chaos. Philosophy, literacy and education was for the most part obliterated. Except, that is, in a small remote western island, a place never colonised by Rome and unknown to Islam, where another culture was vibrant; learning, travelling and above all, writing. This was Ireland.

Christianity and The Irish Martyrs

Following St Patrick's death, three categories of Irish 'martyr' were recognised. The first were The Red Martyrs prepared to die for their Christian faith. In practice, there were no Irish Red Martyrs during the first millennium as Ireland's conversion to Christianity had been peaceful. The second were The Green Martyrs who, as hermits, went into internal exile and the final group were The White Martyrs who would leave Ireland forever.

The most famous of the Green Martyrs was St Kevin of Glendalough (498 -618 CE) who initially lived the life of a hermit until he was persuaded to found a colony at Glendalough. St Columcille (521 to 596 CE) was the first



Figure 5. Ruins of Columcille's Monastery, Gartan, Co. Donegal

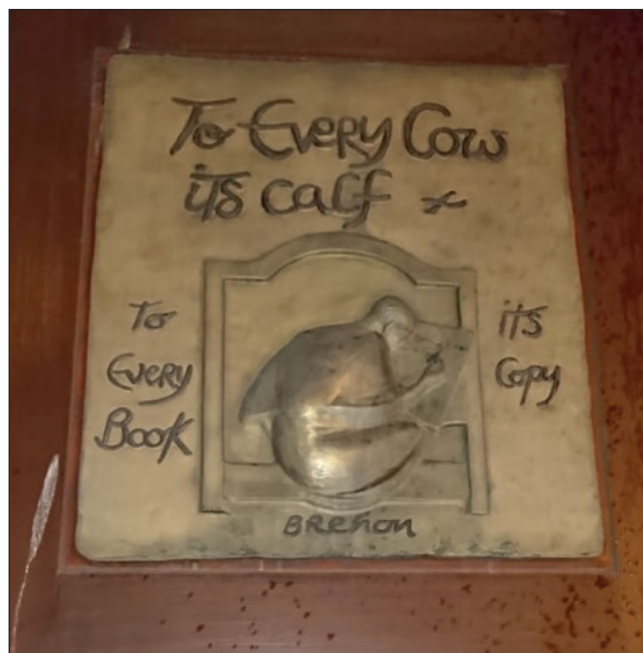


Figure 6. The Bar Library, Royal Courts of Justice, Belfast

of the White Martyrs. Christened Crimthann (The Fox), he was born in Gartan, County Donegal into a prominent and privileged family (Figure 5. Ruins of Columcille's Monastery, Gartan, Co. Donegal). St Columcille was the most influential of the Irish Abbots. He surreptitiously copied a psalter without permission of its owner, his master Bishop Finian entitled *An Cathach (The Warrior)*. For this crime, King Diarmait delivered his famous judgement, "To every cow its calf and to every book its copy." (Figure 6, The Bar Library, Royal Courts of Justice, Belfast).

Diarmait's judgement was in effect for breach of copyright. St Columcille was subsequently excommunicated and eventually exiled. He travelled to the island of Iona, then part of the kingdom of Dalriada. He settled in a site where there was no view of Ireland. He founded a community whose limit was set at 150. When this number was exceeded, 'twelve monks plus one' would leave to establish a new community. Visitors came to learn and many never left. The first to go was his greatest disciple, St Aidan. Aidan founded the great monastery at Lindisfarne. St Columbanus and St Gall travelled East founding Monasteries such as those at Auxerre, Regensburg, Salzburg, Vienna, Bobbio and Lucca. Others like St Brendan sailed West and is said to have discovered America, possibly Newfoundland. (Figure 7. St Brendan The Navigator).

Irish versus European Christianity

Rome was now, in every sense, very remote. As Sedulius of Liège, a 9th century Irish Ciceronian scholar wrote:

To go to Rome

Is little profit, endless pain;

The Master that you seek in Rome,

You find at home or seek in vain.

Celtic Christianity was therefore practised very differently



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.



Figure 7. St Brendan The Navigator

than it was in mainland Europe. The Irish monks' tonsure involved shaving the head from the forehead back to a line between the ears and was worn long at the back, a nod to Ireland's druidic past. The influence and authority of women in the Celtic church was much more recognised and Abbesses were common, notably St Hilda, the Abbess at Whitby. The Irish Church's date for Easter was different from Roman Europe's, and the Irish practised private confession, unlike their European counterparts. Differences between the Roman and Celtic churches came to a head in 655 CE at the Synod of Whitby and consequently Ireland fell into line with European Christian practice. The Irish delegation scored one victory and the European church adopted private confession, abandoning the practice of a penitent's public humiliation.

The monks in their monasteries copied the gospels. They principally wrote in Latin but also in the vernacular, Irish, which was most unusual. They copied any Greek and Latin work they could find, almost indiscriminately, but also loved to record folk stories and legends. As they travelled East across Europe, they brought their books, tied to their belts. As they fanned out, founding monasteries and copying books, the influence of these Celtic monks increased. However, they weren't philosophers. All that had gone in Europe for now. Gone, except for one man; an Irishman named John Scotus Eriugenus (815 - 877CE). Eriugenus was a neo-Platonist philosopher, and as philosophical discourse had been dormant since the death of Boethius in the 5th century, he stood out on the landscape. Aside from the Papal Librarian, Anastasius, he was the only man in Europe known to be fluent in Greek. He posited that philosophy should come

first and that theology was derived from it. His great work, *The Division of Nature*, probably advocated Pantheism. The Pope, Honorius III, said that his books were "swarming with worms of heretical perversity" and ordered all copies to be burnt. Many were but not all. Burning books was not part of these Irish monks' psyche. So, Irish monks copied books and travelled East. In Spain, Venice or Constantinople they encountered Muslim scholars who copied the monks' books. The survival of the Latin canon is largely due to these Irish monks. Although other sources were available for Greek and possibly Hebrew works, Latin texts had all been but lost outside Ireland. So; now, we finally consider Avicenna.

Avicenna

Avicenna was a philosopher, physician, mathematician and metaphysicist. He was also, as you will learn, not tortured by self-doubt. As a young boy, it was necessary for him to learn Arabic in order to read the Koran. He wrote later, "By the age of ten, I had mastered The Koran and I was marvelled for my aptitude." Next, he learnt the sayings of Muhammad (*The Harith*); Islamic law (*Sharia*) and jurisprudence (*Fiqh*). Then he turned his attention to philosophy. His father engaged a philosophy teacher named Al-Natali, for him, and Avicenna began to study Plato and Aristotle. He also studied the mathematics of Euclid and Ptolemy. He wrote "Al-Natali was extremely amazed at me; whatever problem he posed, I conceptualised better than he." Avicenna contended that philosophy encompassed the pursuit of all knowledge and for him its most important branch was theology. Knowledge, he believed, was the criterion by which souls would be judged in the afterlife. Avicenna sought to reconcile his belief in God (revelation) with the rationalism and logical methodology that he had learned from those ancients, the Greek philosophers.

Avicenna distinguished Existence (*wujud*) and Essence (*mahiat*). For him essence was the characteristic of something, living or inanimate. Existence was the addition of matter to essence. For example, a centaur has the essence of a man and a horse but does not exist. Avicenna introduced the concept of God as *Necessary Existence*. For him, the universe was eternal, emanating from God's self-knowledge and caused because it is an aspect of His essence. God, he believed was The Necessary Being. Everything else was simply possible.

The Floating Man

This is perhaps Avicenna's greatest metaphysical thought experiment. He asked the reader to consider the following idea. A man is born, fully formed, floating on his back in mid-air. He is blindfolded. Created from nowhere, Avicenna posed the question, "What would that man's first realisation be?" His answer was that the man would realise that he *existed*, despite the absence of any sensory input, evidence or memory. Avicenna considered this as proof of the soul's existence. This philosophical thought would resonate centuries later as Cartesian Duality: that of the soul and the body.

Avicenna and Medicine

Muslim medicine was greatly influenced by the Greek tradition. Avicenna studied both Galen and Hippocrates. By the age of 15 he had become a physician. About medicine he wrote "Medicine is not a difficult science and naturally I excelled at it in a very short time." At the age of 18, he had a very lucky break by curing the Sultan, Nuh Ibn Mansur. His reward was access to the Sultan's Royal Library. In 1012 CE, he began to write *The Canon of Medicine*. This work is in five volumes and has greater than a million words. Avicenna wrote "Medicine is a science from which one learns the status of a human body with respect to what is healthy and what is not in order to preserve good health when it exists and to restore it when it is lacking." It would become a standard global medical work until the 18th century. *The Canon of Medicine* was influenced by Galen and Hippocrates, but Avicenna also linked it to Aristotle's philosophy. William Osler described *The Canon of Medicine* as, "The most famous medical textbook ever written."

In later life, Avicenna was often on the run and wrote many of his 200 books entirely from memory. He died on the road with the Sultan, fleeing Isfahan, at the age of 57. He wrote, "I prefer a short life with width to a narrow one with length." Avicenna didn't believe in a physical resurrection. He denied that humans could define God. These views and his unconventional lifestyle incurred the wrath of traditionalists.

The End of the Golden Age.

The reasons for the Golden Age's demise were probably multifactorial. Firstly, there was a change in theological direction. Al Ghazali (1058 - 1111CE) was the key figure responsible for this. A highly respected academic who in later life embraced Sufi theology, he was the author of over 70 books on science, philosophy and theology. His book entitled *The Incoherence of Philosophers* questioned the morality of studying Greek philosophy. Ibn Rushd (1126-1198 CE) known as Averroes in The West, was a noted jurist and physician. Born 15 years after Al-Ghazali's death, his book *On Medical Generalities and Particularities* would be used in the Jewish, Christian and Muslim world for centuries afterwards. He retaliated against Al-Ghazali with his own philosophical work, *The Incoherence of Incoherence*. However, the die was cast and he marks the end of an era. Interest in Greek philosophy was waning and the torch was passing. The Mongol siege of Baghdad in 1258 CE was also a significant event. It is estimated that a million people lost their lives and that was said that the river Tigris ran black and red. Red, with the blood of the dead and black from the ink of the books thrown into the river by the invading Mongol hordes.

Finally, Gutenberg's printing press dealt a serious blow. The Catholic Church approved of its new printed Bible. It also realised the potential of mass production of plenary indulgences, until then a hand-written (*manuscript*) document written by monks. The printing press was, literally, a licence to print money. In the Islamic world, The Koran continued to be reproduced by hand. There were technical reasons for this. Arabic characters could change their shape depending

on the position within a word, and this presented difficulties for the printing press. However, as Muslims considered The Koran to be the actual divine word of God, it was not felt a suitable object for mass production. For both these reasons, mechanized printing did not find favour within Islam. Meanwhile, transmission of the printed written word accelerated across Europe, thus eclipsing The Golden Age.

Avicenna's Legacy

Avicenna's contributions to medicine and philosophy are immense. He was known in the Muslim world as The Third Teacher, after Aristotle and Al-Farabi. With *The Canon of Medicine*, Avicenna placed a keystone in the arch that bridged the medical systems of Aristotle and Galen with modern medicine. In the field of philosophy his metaphysics would have a profound effect on scholastic philosophers like Thomas Aquinas. Avicenna was searching for a way to understand the universe based both on the laws of cause and effect and a loving God. He wrote, "The heart of learning is a direct insight into the rational principles upon which the world is constructed."

The Hinges of History

In the Houses of Wisdom, Christian Jewish and Muslim scholars translated the books into Arabic. The wisdom of the ancients ignited The Golden Age. The decimal system ('Hindu Numerals') would spread across the known world. Mathematics, algebra, trigonometry and algorithms were invented and geometry would become conceptual. The luminaries of this golden age made discoveries in astronomy, geology, cartography, physics, chemistry and logic. In medicine, advances were made in medicine itself but also in pharmacology, surgery and ophthalmology.



Figure 8. The Conquering of Muslim Spain. Bas Relief, Palma, Majorca

When Christians conquered Muslim Spain (Al-Andaluz - The land of The Vandals) they found translation institutions where multicultural scholars were harmoniously at work. (Figure 8. *The Conquering of Muslim Spain. Bas Relief, Palma, Majorca*) The Now the process would reverse and Christian scholars learnt Arabic to translate these books into Latin. The Catholic Church had previously mostly banned study of the ancient Greeks, considering them to be pagan, but the scholarship of The Falasifa, reconciling Greek thought within a religious framework, reignited Western interest in Greek philosophers.

From our 21st-century vantage point, we owe a debt to those visionaries from that Golden Age. Without them, so much



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.



Figure 9. The Monk and Pangur Bán. Sculpture by Dr John Bryson Martin

knowledge and thought would have been lost to us. Ireland made its own contribution with the Latin Canon. Monks, spreading the gospel, writing and copying as they travelled East across Europe could be considered a flickering light in those Dark Ages. If I may, I should like to conclude with one example. On the shores of Lake Constance in Austria, an 8th century Irish monk in his cell was working on a manuscript entitled *The Reichenau Primer*. With him, in his cell, was his little cat, Pangur Bán. (Figure 9. *The Monk and Pangur Bán. Sculpture by Dr John Bryson Martin*). The monk realised that the cat's mission - to catch mice - was similar to his own: to catch souls. In the margin of the manuscript, he wrote a poem about his little cat that is still visible to this day. This is its last verse:

*Practice every day has made us
Perfect in our trade
We get wisdom, day and night,
Turning darkness into light.*

Thank you for your very kind attention.

Correspondence to: Professor Barry Kelly
Consultant Radiologist,
Royal Victoria Hospital Grosvenor Road,
Belfast BT12 6BA
Email: barry.kelly@belfasttrust.hscni.net

Acknowledgements

I would like to thank Dr Moya Carey, Curator of Islamic Studies, Chester Beatty Library, Dublin and Drs Mohammad, Dr Reza Al-Saudi, Debarata Bhattacharya, Ali Meritek and Adam Nelson, Dept of Radiology, Royal Victoria Hospital, Belfast, for their assistance with Arabic and Indian texts. Any residual errors are mine alone.

Further Reading

Marr A. A history of the world. London: Pan Macmillan; 2012.

Cahill T. How the Irish saved civilization. New York: Doubleday; 1995.

Manchester W. A world lit only by fire. The Medieval Mind and the Renaissance. New York: Little, Brown and Company; 1992.

Al-Khalili J. Pathfinders: the golden age of Arabic science. London: Penguin; 2012.

Khan A. Avicenna: Muslim physician and philosopher of the eleventh century. New York: Rosen Publishing Inc; 2006.

Gaskill T. Avicenna and Medieval Muslim Philosophy. [CD audiobook]. New York: Blackstone Audio; 2013.

Fakhry M. Al-Farabi: founder of Islamic Neoplatonism: his life, works and influence. Oxford: Oneworld Publications; 2002.

Gutas D. Greek thought, Arabic culture. The Graeco-Arabic translation movement in Baghdad and early 'Abbasaid society (2nd-4th/5th-10th c.) Oxford: Routledge; 1998.

Medical History

J.A. Lindsay's Tonics and Tinctures for Cardiac Care (1889-1904)

Tracy Freudenthaler

INTRODUCTION

This article presents a brief overview of vintage pharmaceuticals and treatments recommended for patients with heart conditions by former Ulster Medical Society's President, Dr. James Alexander Lindsay (1897-1898). While Lindsay was learning some of the technological advancements occurring during his time (i.e. electrocardiography), it is evident he was not ready to abandon earlier methods of diagnosis and patient care. This article includes excerpts of unpublished handwritten journal entries from 1889; then it presents a brief assortment of these treatments and therapeutic approaches found when reviewing his published works.

James Alexander Lindsay, MD (1856-1931)

James Alexander Lindsay (Figure 1) became a Doctor of Medicine in 1882, and two years later was full physician¹. His service includes chair of the board of management of the Royal Victoria Hospital and chair of medicine in Queen's University Belfast. Many important positions were entrusted to him in the medical organizations he joined; these included the Ulster Medical Society (President 1897-1898), the Royal Academy of Medicine in Ireland, the Association of Physicians of Great Britain and Ireland and the Aristotelian Society².

He was known for his steadfast adherence to well-aged traditions. He said in 1916, 'But I should be the first to deprecate any exclusive reliance upon instrumental methods in the study of heart disease'³. His philosophical approach favored experiential medicine, as noted in his

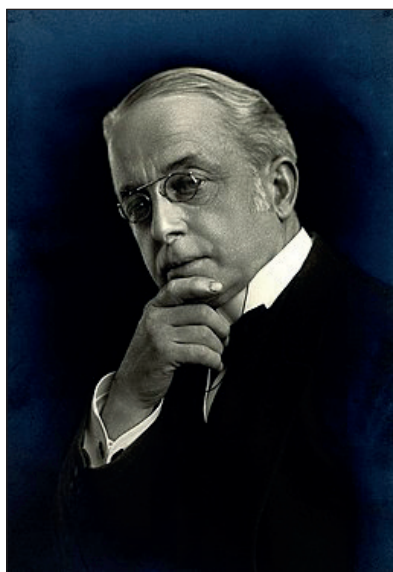


Figure 1:
James Alexander Lindsay.
Photograph by Elliott & Fry.

published works that span 40 some years from 1885 until 1929, including his well noted *Medical Axioms, Aphorisms, and Clinical Memoranda* in 1923.

Recently, the author's 2021 discovery of an unpublished handwritten medical journal owned by contemporary esteemed physician, Dr. Henry "Health" O'Neill, has revealed

Table 1: Mitral Regurgitation (*Regurgitation*):

Mitral Regurgitation (*Regurgitation*):
Transcript of Dr. Lindsay's handwritten
journal notes (1889)

- Acute rheumatism is generally followed by heart disease
- Preliminary symptoms, cardiac affection, 1. Dyspnea, 2. Dyspepsia, 3. Palpitation
- The most common cause of Heart Affection is Rheumatism
- Then comes excessive muscular exertion we most commonly find it in those who lead a laborious life
- Valves affected, speaking generally, the mitral valve is the most commonly affected in youth. The aortic in advanced age.
- Beat visible in health. The beat of the heart should be visible at a spot about a square inch, in the fifth intercostal space. It may, however, not be seen, on account of great thickness of the chest walls, either from muscle or fat.

several entries from Dr. Lindsay. Among these entries were found various ailments of the heart and pharmaceutical remedies. Reviews of his existing publications reveal this was indeed his area of practice evidenced in his hefty 447-page 1904 publication: *Lectures chiefly clinical and practical on diseases of the lungs and the heart*⁴.

Correspondence to:

Tracy Freudenthaler, PhD, MPH
Assistant Professor, MPH Program
Department of Health Professions
Gregg Wadley College of Science and Health Professions
Northeastern State University - Muskogee Campus
2400 W. Shawnee St., Administration Building Room 181
Muskogee, OK 74401

Email: freuden@nsuok.edu



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Conditions of the heart

Lindsay's handwritten journal entries begin November 2nd 1889. He begins by presenting a brief case of a 29-year-old

Table 2: General Symptoms-Cardiac Affection:

General Symptoms-Cardiac Affection: Transcript of Dr. Lindsay's handwritten journal notes (1889)	
1.	Effect on the heart itself. Pain. Palpitation Pain, however, may not be present at all, and very often is not, except in cases of angina pectoris.
2.	Effect on General Circulation. The circulation is impeded. The veins are too full, and congested.
3.	Effect on Lungs, Dyspnea. Cough.
4.	Various organs. To find out the effect on these, let us follow the course of the circulation.
a.	Brain. The vitiated supply of blood produces headache, vertigo. Disinclination for mental work.
b.	Stomach or intestine, Dyspepsia
c.	Liver, Kidneys, etc.

male plumber, who at the age of 23 had acute rheumatism. While quite well for five years, 'three weeks ago began to suffer from cough, and shortness of breath, after muscular exertion, or going up gangways, etc.' From there, he presents Mitral Regurgitation (*Regurgitation*), transcribed verbatim in Table 1. The notes reflect his observations where age and lifestyle are the associated factors related to specific areas of the impacted heart. Next, Lindsay presented general symptoms for 'Cardiac Affection' transcribed verbatim in Table 2. Note, he writes and ordered list, perhaps indicating how he has witnessed the presentation of symptoms and progression of complications to other organs and systems. Curiously, he notes the 'course of the circulation' starting with the brain; adding that failing circulation in the brain will result in headache, and 'disinclination for mental work'. It is interesting that Lindsay was astute that a patient's mental functioning could be impacted during times of underlying physical issues.

A philosophical approach to care

Lindsay's approach to cardiac care was memorialized in his presentations and publications, yet he took a philosophical approach when *presenting* his methods. He had a '... reverence for aphorisms, pithy generalizations, embodying clinical wisdom and proverbs...'². His approach was based on keen observation first, emphasizing lifestyle behavior changes, then he would employ drug therapies.

Reviewing Lindsay's writings provide further insight that providers must guide their patients through behavior changes rather than be swift to label their medical ailment. In fact, he suggests dwelling on a diagnosis of a heart condition can do more harm to a patient than good. The following quotes were taken from *Lectures chiefly clinical and practical on*

diseases of the lungs and the heart (1904):

'The chief points to be borne in mind are the avoidance of excessive strain, severe labour, too strenuous amusements, unhealthy excitement, and imprudence in eating and drinking'⁴.

'Many of these patients are to be cured, not by systematic treatment, but rather by the absence of it, by continuous occupation, mental distraction, and the avoidance of morbid introspection'⁴.

He lauded and wrote a treatise on the old physicians, quoting Hippocrates, "Natural powers are the healers of disease"⁵. Lindsay went on to say 'Hippocrates has left a message to all of us to-day-the importance of carefully bedside observation; the need to study medicine in light of experience and not to be hide-bound by theory'⁵.

In this spirit, Lindsay begins a treatment focused section (Figure 2) of the handwritten medical journal with the

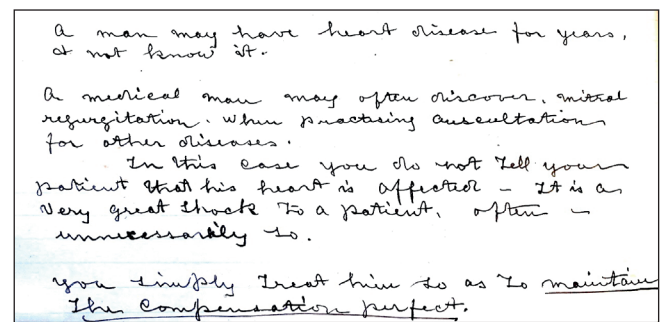


Figure 2: Image from Dr. Lindsay's handwritten journal entry, 1889.

philosophical question 'What does nature herself do to repair the mischief?' Careful to note that 'A man might have heart disease for years and not know it', again, he warns about sharing a diagnosis with the patient. 'A medical man may often discover mitral regurgitation when practicing auscultation for other diseases. In this case, do not tell your patient that his heart is affected-It is a very great shock to a patient. Often unnecessarily so.' Rather, treat the heart to maintain the current state if the heart was compensating, 'no ill effect will be felt'. It was important to 'prohibit excitement or over-exertion, intemperance' during this time.

Dietary considerations for cardiac care:

Dr. Lindsay believed the value of proper nutrition in managing heart conditions. He identified there was a relationship between nutritional intake and the health of the heart of his patients. The following are two excerpts from page 422 of his 1904 publication:

'Again, and again I have seen cardiac cases improve rapidly when taken off their slops of beef-tea, chicken broth, arrowroot, and the like, and put upon a limited diet of fish, chicken, tender meats, stale bread, boiled eggs, and green vegetables. It is indispensable to secure that the meals shall be moderate or small in quantity, slowly eaten, and that mastication shall be thorough.

Limitation of fluids is important...⁷⁴.

'...light diet of milk, simple puddings, beef juice and the like will be required for a time, but it must always be remembered that a carbohydrate diet tends to gaseous distension of the stomach and acidity, and that these factors do much to aggravate the sufferings of cardiac patients'⁷⁴.

A lengthier review of Lindsay's work would offer more thorough presentation of his views on lifestyle and behavioral factors related to heart conditions. Yet, it is important to include some examples here as they reflect historic approaches to care. It would appear in Lindsay's case his first

Table 3

Pharmaceutical Remedies: Compilation Transcript of Dr. Lindsay's handwritten journal notes (1889)
<ul style="list-style-type: none"> • "...administration of Tonics, as Iron, Quinine, Strychnine'. • when compensation is failing, '...we have a choice of drugs which are beneficial in their action on the heart, digitalis, Casca, Strophantus. However, opinions may differ about the last two names, there can be no doubt as to the useful effects of Digitalis. This drug has long been considered as a sedative. Dr. Walsh has called it 'the opium of the heart'. This however is a mistake. The effect of digitalis is to increase the tensions of the arteries.' • Remember that Digitalis is one of those drugs with which you must not exceed the pharmacopoeial dose. • "It is a common error to give digitalis in the first stage of disease, when compensation is perfect. In this case its action is not beneficial." • "Strophantus is principally prescribed for mitral obstruction". • 'You can combine your digitalis with a tonic as Iron or Strychnine. Then add a bitter, say Senega or Columba.

approach to treatment was to modify behavior, not introduce pharmaceuticals. Contrarywise, the next section presents remarkable details and descriptions of tonics and tinctures he used over the course of his practice.

Tonics and tinctures for cardiac care:

Pharmacologically, Lindsay used several approaches for care, his writings and journal entries offer reasoned rationale behind some recommendations, for others there is simply commentary. He is quite specific presenting several '*Tonics*' for trial with patients. For example, his works mention ingredients containing iron, quinine, and strychnine. At the time these remedies would have been quite common, 'No two drugs are more generally prescribed together than quinine and strychnine. They are found in such preparations as pills, syrups, tablets, powders, glycerites and elixirs'⁷⁶.

This offers valuable insight to approaches to drug therapy during the time.

Many of the 'Tonics' and prescriptions (i.e. strychnine, mercury, opium) presented by Lindsay and his contemporaries were under scrutiny during the late 1800's and turn of the century. Today, many of the remedies are restricted or no longer prescribed due to safety concerns. Yet, in reviewing Lindsay's works, it is clear they had not been abandoned. Table 3 presents a compilation of transcribed notes from the 1889 journal entry.

The following are excerpts from Lindsay's 1904 *Lectures chiefly clinical and practical on diseases of the lungs and the heart*⁷⁴. Many of these remedies were noted for functional disorders, where first lifestyle related changes were needed. Based on the condition of a man's heart, Lindsay offers a host of considerations related to diet, occupation, exercise, and even marriage. Concerns of the patient's stress level and nervous tendencies would indicate drug interventions, or the presence of other strong complaints. Figure 4 shows his recommendation 'To this end administer Tonics as Iron, Quinine, Strychnine.'

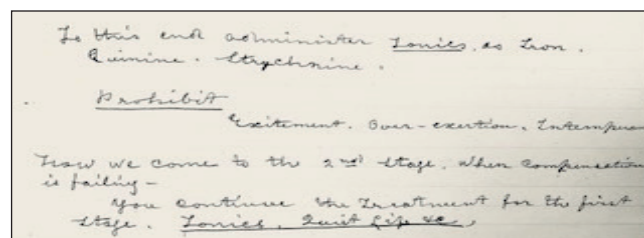


Figure 4: Tonics with Iron, Quinine, Strychnine

- 'The most generally useful of the drugs is strychnine... should be given in small doses, and only in cases where there is not much nervous irritability.'
- 'Arsenic is, perhaps, the next remedy in order of utility. It shines most conspicuously where the neurotic element is prominent and is allied with anaemia'.
- 'Digitalis and Strophantus are not to be advised in functional disorders'
- 'Ammonia, ether, camphor, valerian, and asafetida are sometimes useful, and should not be forgotten'
- 'The combined valerianates of iron, zinc, and quinine have sometimes seemed to me to be efficacious'
- 'Quinine does not, as a rule, shine in functional heart disorders, but its general tonic and appetizing properties may sometimes be brought usefully into play'
- '...Guy's or Bailey's pill is a valuable combination, but I am inclined to doubt whether the squill which it contains is essential to its efficacy. On the whole, however, the habitual association of digitalis and mercury is not a convenient mode of administration. These drugs are better given separately.'
- 'Strychnine, iron, arsenic, and bitter tonics may sometimes be employed with advantage.'
- 'Caffeine is a drug which may find a place in



therapeutics of valvular disease, but I have seldom seen any brilliant results from its use alone⁴.

Digitalis and Strophantus as preferred treatments

Lindsay called Digitalis 'our sheet anchor' in the treatment of valvular disease with failing compensation⁷. Its value appears in many published discourses and Lindsay's written articles, as well as the handwritten journal entries. Digitalis appears to be the preferred treatment of the time and in his practice. 'The combination of iron with digitalis is a frequent and valuable one'⁴. He adds 'It increases the force of systole, prolongs diastole, and raises the tension in the arterioles. It is indicated in every case of failing compensation...'⁴. Figure 3 shows his tincture prescription from his 1889 journal entry. Below is another preparation.

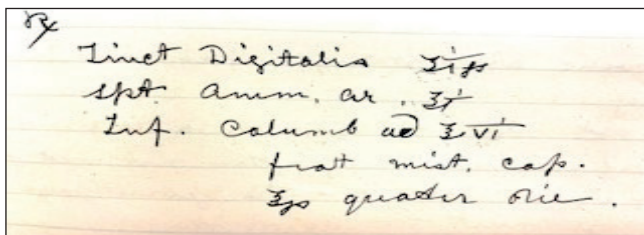


Figure 3: Dr. Lindsay's Digitalis Tincture (1889)

'As regards the form of the drug, the tincture is the usual favorite in the British Islands and in America, while the powdered leaf finds more favour on the Continent of Europe. I include to the latter preparation, and usually prescribe it in pills of 1 gr. or 1 1/2 gr. Combined with a little extract of gentian. These pills, or the same amount of the leaf in the form of powder, may be given twice, thrice, or four times daily according to circumstances'⁴.

Variations in preparations of Digitalis with other substances were common at the end of the 1800's and first of the 1900's. Doctors G. F. Strong and A. Wilmaers studied dosage preparations based on '...the cat method...' in 1923. The cats were used to find the minimal toxic dose, which was a concern of the time related to potency of the preparations. 'Tincture of Strophantus...is about fifty times more active than tincture of digitalis when given intravenously'⁸. They found most manufacturers had similar standards in their formulas. Commonly known pharmaceutical houses were making tincture Digitalis and tincture Strophantus formulas at the time: E. B Squibb & Sons, John Wyeth & Bro. Parke Davis & Co.⁸. Other companies were making similar preparations, such as Strophantia Boehringer by Merck & Co. Strong and Wilmaers cautioned against using the manufacturer's droppers as patients would invariably self-administer the incorrect dosage⁸, which would likely result in a serious, even fatal outcome.

Gastric side effects were noted side effects of Digitalis use. Yet, Lindsay associates the complaints with the assorted items found within the digitalis tonics, such as carbonate of ammonia, iron, squill, and mercury⁴. Emphasizing 'Only those who make a practice of habitually employing Digitalis by itself can thoroughly appreciate its value'⁴. He notes '...

where digitalis has failed, strophthanas rarely succeeds; Under this (*Digitalis*) treatment the ventricles in many cases rally the heart's action becomes slower, stronger, and more rhythmical, the arterial tension rises, the excretion of urine is increased, the dyspnea is relieved, and the general condition improved'⁴.

Cardiac patients with insomnia:

Lindsay noted insomnia was an associated complication of heart disease, at times unmanageable without pharmaceutical interventions. The narrative presented here is noticeably brief, but significant for memorializing historical uses of sedatives and hypnotics. Lindsay appeared favorable towards the use of morphine, paraldehyde, opium, trional, and camphor. His recommendations read as though they were both common and regraded as safe, even if some were combined, such as morphine and alcohol. He does not discuss any addictive properties.

He references Dr. Little's (of Dublin) injectable solution which included morphine sulphate, chloral hydrate, liquid atropine sulphate, and camphor; noting a smaller dose would be needed for a child⁴. Another recommendation to increase relaxation:

'...best in an easy-chair—by hot applications to the precordium, and by alcohol and morphia. Osler recommends paraldehyde. The bromides are seldom of signal service, and sulphonal and trional must be used sparingly. The hypodermic injection of morphia is by far the most effectual remedy, and there is ample evidence that it is safe'⁴.

'When insomnia is a feature with worst cases, 'opium, chloral, sulphonal and trional should be withheld as long as possible, but sometimes it is impossible entirely to dispense with their aid. Hyoscine is a valuable remedy, but must be used with much caution'⁴.

Bloodletting for Dropsy

Changing direction, although he praised various tonics and tinctures, Lindsay recognized there were instances where other interventions were needed. Historically, the term Dropsy was used to describe 'generalized swelling and was synonymous with heart failure'⁹. Relieving the excess fluid, or excess blood, was common historically. Bloodletting, either by venesection or by leeches, purgatives, cauterization, and Southey tubes were popular ways to alleviate symptoms of severe heart failure⁹.

Lindsay noted 'In some cases, the abstraction of a few ounces of blood, either by venesection or leeching, may be necessary before digitalis can exert its full therapeutic effect. The special indication for blood-letting are extreme dyspnoea (*dyspnea*) and orthopnea, with cyanosis and distension of the right heart'⁴. The following describes an intense case of Dropsy, where the use of a common sewing needle would be the instrument of choice for performing the procedure.

'Dropsy must be combated chiefly by the use of the cardiac tonics and by purgation.

Saline purgatives are well borne in these cases, and may be given even when prostration is marked. Diuretin is sometimes useful. Diaphoretics are of little avail, and hot baths and hot-air baths are not suitable for cardiac cases. Puncture of the lower limbs may be practiced when dropsy is marked and the skin tense. It is best performed by making a number of punctures with a darning-needle, and covering the part with flannel bandages run out of hot water and lightly applies. With strict attention to cleanliness this is a perfectly safe procedure, and the amount of fluid thus removed is often remarkable. Southey's tubes may be used, but do not present any decided advantage over the foregoing simple method⁴.

SUMMARY

This article presents a brief assortment of James Alexander Lindsay's (Figure 5) approaches to cardiac care and pharmaceutical remedies from the 1890's and early 1900's. Lindsay's preferred 'Tonics' and 'Tinctures' included a host of ingredients memorialized in his collective published

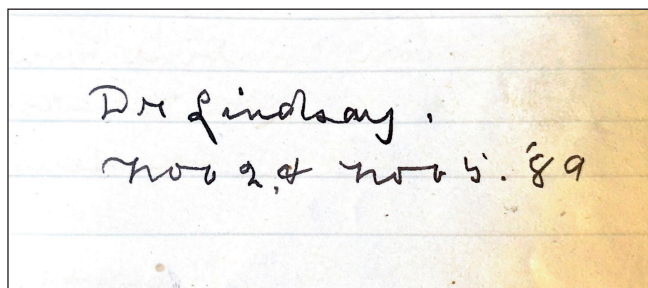


Figure 5: Dr. Lindsay's signature 1889

works and unpublished journal entries. It is important to revisit these early treatments; their historic uses pique interest today, since many are now restricted or banned. Lindsay's over 40-year medical practice was defined by his experiential philosophy and careful adherence to traditional approaches, despite emergent developments in his lifetime (i.e. electrocardiography). Today James Alexander Lindsay is likely best known for his *Medical Axioms, Aphorisms, and Clinical Memoranda*, his collection of philosophical and eloquent proverbs which he dedicated to the students at Belfast Medical School in 1923. 'A good prognosis is the best of tonics for a cardiac patient⁵.

REFERENCES

1. Brown GH. Obituary. James Alexander Lindsay. *Br Med J*. 1931; 2:1201
2. Breathnach C, Moynihan J. James Alexander Lindsay (1856-1931), and his clinical axioms and aphorisms. *Ulster Med J*. 2012; 81(3):149-53.
3. Lindsay JA. Some observations the electrocardiograph, with notes of cases. *Dublin J Med Sci*. 1916; 141: 71-85.
4. Lindsay JA. *Lectures chiefly clinical and practical on diseases of the lungs and the heart*. London: Baillière, Tindall and Cox; 1904.
5. Lindsay JA. Some hints from the old physicians. An address delivered before the Bradford Medico-Chirurgical Society. *Br Med J*. 1923; 2(3284): 1077-80.
6. Watson G. The quantitative separation of Quinine and Strychnine. *Trans Kansas Acad Sci*. 1914; 27: 99-101.
7. Lindsay, JA. *Medical Axioms, Aphorisms, and Clinical Memoranda*. New York: Hoeber; 1923.
8. Strong GF, Wilmaers A. The potency of some common digitalis and strophanthus preparations. *JAMA*. 1923; 80(18): 1308-10.
9. Ventura HO, Mehra M. Bloodletting as a cure for dropsy: heart failure down the ages. *J Card Fail*. 2005; 11(4):247-52.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Curiositas

UNDERGRADUATE QUIZ



Unknown author; public domain image



1. Who is depicted in the top image?
2. What is shown on the bottom image? Who developed it?

Aaron Vage (PhD Student), Centre for Medical Education, Queen's University Belfast.

POSTGRADUATE QUIZ



1. What educational technique is being utilised here?
2. When was this technique developed?

Peter Moore (Academic F2), Davina Carr (Clinical Teaching Fellow), Gerard Gormley (Clinical Professor), Centre for Medical Education, Queen's University Belfast.

HISTORICAL QUIZ



1. What does this image represent?
2. Who used the apparatus?
3. What relevance does it have to today's society?

Image credit: La machine de Madame du Coudray exposée au musée Flaubert et d'Histoire de la Médecine à Rouen by Frederic Bisson. No changes have been made. Available from:

<https://www.flickr.com/photos/zigazou76/8665628775/>

License: <https://creativecommons.org/licenses/by/2.0/legalcode>

Andrew Spence (Academic Clinical Lecturer), Centre for Medical Education, Queen's University Belfast.

AND FINALLY...



The above image depicts a post-simulation debriefing session.

1. Do medical simulations share common structures regarding their design?
2. If so, what commonalities do they share?
3. Can the structural order of a medical simulation be altered?

Aaron Vage (PhD Student), Centre for Medical Education, Queen's University Belfast.

CONSIDER CONTRIBUTING TO CURIOSITAS?

Please refer to 'Curiositas: Guidelines for contributors' <http://www.ums.ac.uk/curiositas.html> and email curiositas@ums.ac.uk with your ideas and submissions.

Curiositas: Answers

UNDERGRADUATE QUIZ

1. In the macabre age of late-19th century Paris, a young lady was hauled from the Seine; lifeless, unknown, and body unclaimed. Ambiguity flourishes in terms of the supposed events leading to her death. However, one commonly recited history is that after a spate of emotionally charged words with her lover, the seemingly irreparable state of the relationship drove this girl to plunge into the Seine, without return¹. In a somewhat ironic twist, little could this heart-broken lover have realized that after death she would go on to have probably the most 'kissed' lips in the world.

2. Whilst waiting for an identification that never came, 'L'Inconnue de la Seine' (the unknown of the Seine) so transfixed one particular mortuary assistant that he demanded a facial cast be taken to preserve her beauty. In the years that followed, L'Inconnue de la Seine's facial cast was reproduced, attracting an almost cult-like entourage of fans, composed of artists, playwrights, and philosophers². Prior to receiving a phone call from the esteemed physician Peter Safar, author of 'ABC of Resuscitation' about the manufacture of a rubber mannequin to be used for CPR, the Norwegian toymaker, Asmund Laerdal, had recently saved his small son from drowning³. Receptive to the issue at hand, Laerdal set about creating a realistic, rubber female head and torso, but couldn't decide on a face. One evening whilst having dinner at his in-laws, Laerdal noticed a serene female face hanging on the opposite wall; briskly deciding to take it down and use it for his mannequin. Resusci Anne, now fondly known as CPR Annie, was born⁴.

Most, if not all, medical students will encounter CPR Annie at some point during their studies. However, the next time your lips are pressed to hers, remember that you're training to save a life on the facial reproduction of L'Inconnue de la Seine, a lady whose life may have been longer, had someone known how to resuscitate her!

¹Gordetsky, JB *et al* 2020. *Anesthesia & Analgesia*, 131, 657-659.

²Loke, S & McKernon, S 2020. *BMJ*, 371, m3899.

³Tjomsland, N & Baskett, P 2002. *Resuscitation*, 53, 115-119.

⁴Lind, B 2007. *Anaesthesiologica Scandinavica*, 51, 1051-1053.

POSTGRADUATE QUIZ

1. Moulage, from the French moulé (to mould), traditionally describes the process of making wax casts of anatomical specimens. More recently this practice has evolved into the use of special effects makeup to simulate disease and injury and allow an immersive environment for the student learner¹.

2. The exact origins of moulage are uncertain. Whilst the process of casting human body parts can be traced to the ancient Egyptians' mummification process, moulding for the purposes of education seems to have begun in the 17th century. Gaetano Giulio Zumbo, a Sicilian abbot, presented wax models of anatomical specimens across Europe. Towards the beginning of the 19th century, dermatological models became the prime utilisation of this method^{2,3}. More recently, moulage has been used extensively in the world of simulation teaching. Below are a few examples of how moulage has been used at Queen's University Belfast: left, self-inflicted lacerations moulage (temporary transfer tattoo); middle, dermal nevus prosthetic; right, superficial spreading melanoma (temporary transfer tattoo).



¹Stokes-Parish, JB *et al* 2018. *Nurse Education Today* 64:49-55.

²Riva, A *et al* 2010. *Journal of Anatomy* 216(2):209-22.

³Worm, AM *et al* 2007. *Journal of the European Academy of Dermatology and Venereology* 21(4):515-9.

HISTORICAL QUIZ

1. Two hundred and sixty years ago, French midwife Angelique Marguerite Le Boursier du Coudray embarked on a journey to bring healthcare education to the masses. To address the high infant mortality rate, she identified deficiencies in young women's knowledge in the process of birth¹. Nick-named 'The Machine', Madame du Coudray developed an obstetric manikin consisting of a female pelvis complete with womb, pelvic organs and infant to demonstrate the critical steps involved in birth. Manufactured from leather, cotton and canvas, this combination of basic materials created an opportunity to truly save lives².

2. Authorised by King Louis XV in 1759, over a quarter of a century as du Coudray toured the Kingdom of France, it is estimated she taught in excess of 5,000 doctors, surgeons and nurses the process of childbirth through simulation. Mechanical elements including strings and straps to simulate stretching of the birth canal and perineum and a separate detailed infant attached via umbilical cord. Complete with a shaped nose, ears, drawn on hair and mouth she also demonstrated management of complications such as breech position deliveries³.

3. Through her pioneering efforts, du Coudray was appointed head accoucheuse at the Parisian Hotel Dieu Hospital, leaving an enduring legacy of learning through simulation in obstetrics, the principles of which are still in use today. Running paid courses complete with certificates of completion, her teaching model included peer-to-peer learning through her former students, mirroring modern-day medical education training⁴. Furthermore, the use of literature to accompany The Machine provided a written guide on childbirth, including management of complications, which supplemented clinical skills gained through hands-on practice: essential components of modern-day medical education through simulation, over a quarter of a millennium later¹.

¹Halff, R 2014. *Angelique Marguerite Le Boursier du Coudray's Abrégé de l'art des accouchements*. The New York Academy of Medicine: Books Health and History.

²Jandu, G & Khan, A. 2021. *Journal of Medical Biography* 29(2):121-122.

³Gelbart, N 1999. *The King's Midwife: A History and Mystery of Madame du Coudray*. California. University of California Press.

AND FINALLY...

1 and 2. As simulation-based medical education (SBME) has developed through the years, the structure of the student simulation experience has evolved to encompass several phases. Whilst each training centre will develop its own plan regarding SBME, there are three common phases in simulation: briefing, simulation and debriefing. During the briefing phase, educators aim to reduce learner anxiety by introducing the simulation landscape and constituent simulators. The simulation phase involves participation in a designed scenario. The debriefing phase is traditionally a post-simulation feedback session, where educators encourage learners to share their emotional responses and thought processes concerning the simulation, allowing reflection and informed discussion in terms of learning and performance¹. Debriefing can further be divided into three subphases, reaction, analysis, and summary. The reaction subphase encourages learner self-expression. Analysis is generally composed of a formative assessment. The summary delivers critical key messages and points of improvement².

3. In recent years, research has validated the use of intra-simulation debriefing as a tool to aid learner understanding³. These forms of 'debriefing-on-demand' are also touted for their potential anxiety-reducing, performance-enhancing effects, partially due to their ability to alter simulation structure⁴. However, whilst intra-simulation debriefing affords real-time analysis of a learner's anxieties, and consequent performance, it may also act to reduce the overall fidelity of the simulation at hand.

¹Lawson, S *et al* 2018. *Ulster Medical Journal*, 87, 163-167.

²Lilot, M *et al* 2018. *Anesthesiology*, 128, 638-649.

³Schober, P *et al* 2019. *BMC Medical Education*, 19, 334. ⁴McMullen, M *et al* 2016. *Journal of the Society for Simulation in Healthcare*, 11, 157-163.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

So you want to be a

“Sports and Exercise Medicine Physician?”

Michael McLarnon¹, Neil Heron²

INTRODUCTION

It is estimated that approximately 1 in 7 GP consultations are related to musculoskeletal (MSK) disorders,¹ and with appropriate training, over 90% of these consultations can be managed without referral to orthopaedic or rheumatological services.² Moreover, with an increasingly co-morbid, inactive population creating greater demand for the health service,^{3,4,5} the incidence of MSK and other conditions related to a sedentary lifestyle will inevitably increase.⁶ The Sports and Exercise Medicine (SEM) doctor is a relatively new speciality which can help efficiently manage this group of patients with musculoskeletal symptoms, physical inactivity and cardiovascular disease prevention.²

Sports and Exercise Medicine (SEM) became a recognised medical speciality with a dedicated training pathway in 2005.⁷ Still in its infancy, SEM offers broad and dynamic career opportunities, with the scope to manage different patient groups at primary, secondary and tertiary care levels, as well as on the sports pitch.² Many doctors in SEM will have roles both within and outside of the NHS, for example, as team doctors for local or national sporting authorities as well as working within MSK and rheumatology triage services.⁸ Research is actively encouraged within the field, and will help to expand and better define it;^{2,9} many SEM doctors work actively with universities to conduct large-scale research, ensuring the specialty's rapid evolution. Indeed we recently received National Institute of Health Research (NIHR) funding to undertake a PhD into adapting cardiac rehabilitation for use in the transient ischaemic attack (TIA) and minor stroke population, lead by a sport and exercise medicine consultant.¹⁰ This research in the area of secondary cardiovascular prevention is continuing to develop and showing promising results.

What does an SEM doctor do?

The broad basis of SEM covers exercise testing and prescription; diagnosis and rehabilitation of MSK injuries; research (although highly encouraged, this is not an essential component);^{11,12} population-based physical activity programmes and policies; and supporting individual athletes and their teams to maximise performance.^{2,13} There are

additionally several positions available for SEM within the military.⁹

There are several facets to the specialty. The most obvious is working with athletes to help manage their illnesses acutely (for example, at the pitch side or sporting events) and chronically (with rehabilitation, review and therapeutic interventions). One might additionally work with a high-level team (for example, Olympic sports teams) to monitor athletes health and to best optimise performance through health, including considerations surrounding illness prevention.⁸ Secondly, SEM doctors are trained in musculoskeletal medicine and often run clinics dealing with pain and locomotor dysfunction.⁹ They often perform US-guided injections of joints and soft tissues to provide symptomatic management and improve functional outcomes for patients.^{2,13} The third element of the specialty not immediately apparent is the strong emphasis on public health intervention.⁶ Interventions at local and national levels to improve population exercise and activity levels, plus engagement in sports, is of great importance as well as promoting cardiovascular disease prevention. Complexity arises when dealing with co-morbidity to improve patient exercise capacity: for example, the obese patient with osteoarthritis.¹⁴ Another new emerging area for SEM to help manage with the multidisciplinary team, is 'long COVID' as well as input into chronic fatigue, including prescribing appropriate physical activity and exercise programmes. A final area to mention is management, including appraisal, and re-arrangement of medical services. Indeed sport and exercise medicine consultants have successfully been involved in initiating a new MSK service in Northern Ireland primary care, including offering injection therapies, reducing the need for onward referral to secondary care and other MSK practitioners, including physiotherapy.¹⁵

¹ School of Medicine, Queen's University Belfast, UK

² Centre for Public Health, Queen's University Belfast and School of Medicine, Keele University, UK

Correspondence to: Neil Heron

Email: N.Heron@qub.ac.uk



SEM is best suited to individuals that enjoy working within different multidisciplinary teams across multiple environments, as well as those with a keen interest in musculoskeletal, cardiology and public health medicine.² As many SEM doctors work across several roles in portfolio careers, they typically have a varied weekly calendar.⁹ A typical week in the life of an SEM consultant is outlined in **Table 1** below, although this will vary depending on the interests of the clinician and their skill set:

Table 1: A week in the life of an SEM consultant

Day	AM	PM
Monday	MSK triage service	Research/ University work
Tuesday	GP	GP
Wednesday	Ultrasound +/- injection clinic	Research/ University work
Thursday	Sport medicine clinic	Research/ University work
Friday	MSK triage service	Appraisal/CPD work
Saturday/Sunday	Cover of sport teams	Rest/relaxation/ recuperation

Training and training pathway

Although non-specialists can pursue independent learning in sports and exercise medicine, there is a defined higher

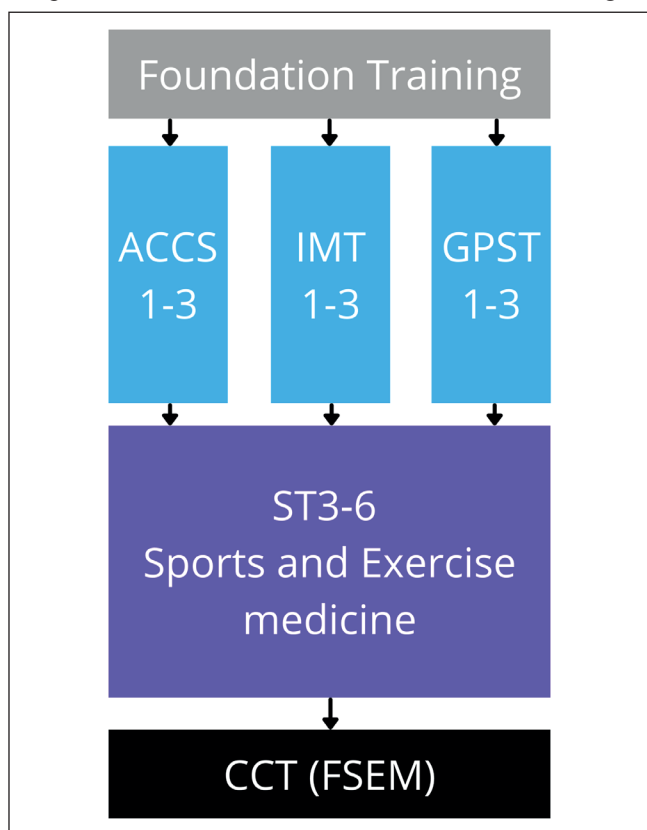


Figure 1: Training pathway after medical school

training pathway to become a consultant SEM physician.² Higher training is a four year dedicated training programme (ST3-6), during which doctors will rotate through periods in musculoskeletal medicine, general practice, public health, accident and emergency, and time working in Sport National Governing Bodies and Home Institutes.² Particular emphasis is placed on relevant clinics and skills within other specialties, such as MSK ultrasound +/- US guided injections, exercise stress testing in cardiology, sports-specific clinics and rehabilitation services.^{2,13} Trainees will take membership exams alongside their training, which they must pass by ST5.

There are several different routes to becoming eligible for applying to SEM. Following foundation training, potential candidates can either enter into Internal Medical Training (IMT (3 years)), Acute Care Common Stem (ACCS (3 years)) or GP Specialty Training (GPST (3 years)).² From their final year of training on any of these pathways, candidates are eligible to apply to higher training in SEM.¹² During these first three years, one must complete their MRCP and/or MRCGP exams.¹² Selection into SEM training occurs via national recruitment, which is a centralised application and interview process.¹² The training pathway is shown in **Figure 1**.

GPwSI in SEM

GPs interested in sports and exercise medicine can pursue this further independently without progressing to formal higher training. Doing so typically takes several years to acquire the requisite knowledge and become established in the field.¹⁶

Multiple qualifications are either necessary or favourable when working towards becoming a GPwSI in SEM. Further qualifications can contribute to a portfolio of evidence for any individual aiming to work in an advanced role. Many GPs work pitch-side for local sporting teams, requiring a Sports Pre-Hospital Immediate Care Course.¹⁷ The Faculty of Sports and Exercise Medicine (FSEM) offer a Diploma in Sports and Exercise Medicine as a benchmark of MSK knowledge amongst healthcare professionals as well as a new Diploma in Musculoskeletal medicine;¹⁸ there are also various postgraduate Master's degrees in SEM offered across the UK.¹⁷ Interested GPs may also wish to revise for and take the FSEM membership exam.¹⁶ These formal qualifications aside, GPs may show further interest in the specialty through attending courses and conferences related to SEM and subscribing to SEM journals, such as the British Journal of Sports Medicine.^{16,17}

To practically gain exposure to the field, prospective GPwSI's will typically take on roles as the team doctor for local sporting teams or as the doctor-on-call at sporting events.¹⁶ Within their practice, they might run several clinics a week specialising in MSK or sports medicine and even offer therapeutic joint injections or other minor interventions.¹⁴ One article by the British Association of Sports and Exercise



Medicine (BASEM) recommends a minimum of four sessions per week and estimates a five to eight-year journey to achieve high levels of competence.¹⁶

Getting experience in SEM and building a competitive application

Since SEM is not formally covered within most undergraduate curricula or offered as a specialty during early medical training,⁶ gaining exposure is a largely self-directed process requiring initiative. Training posts are competitive to attain, with ST3 competition ratios of 5.83, 2.91 and 3 for the last three years, respectively.^{19,20,21} Regularly reviewing the person specification for entry in to SEM training provides insight into many of the essential and desirable criteria for applicants, and may help frame relevant CV building.¹²

At any career stage, those interested in SEM can undertake research related to the area, best done under the supervision of a qualified SEM doctor or within a higher degree. Aforementioned, higher degrees can be taken post-qualification or as part of an intercalated degree; both are looked upon favourably.¹² Students and junior doctors can also apply and become a member of BASEM, and join their local branch of the Undergraduate Sports and Exercise Medicine Society (USEMS).^{6,13}

There are additional proactive steps that one can be taken at medical school or as a junior doctor.

In medical school

In medical school, interested students can first gain exposure to SEM through student selected components/modules (SSCs/SSMs). These are offered throughout the undergraduate course and where modules specific to SEM aren't available, there is usually scope for students to organise their own SSC, for example, through reaching out to an SEM consultant. A SSM in sport and exercise medicine has been developed by Dr Heron at Queen's University Belfast for medical students to develop initial experience in sport and exercise medicine during their medical degree. Following this, they may wish to undertake a related intercalated year.

In their penultimate or final year of university, students avail of an overseas medical elective.²¹ This is an excellent opportunity to gain further exposure to SEM with the potential to work with different global sporting teams and organisations. BASEM offers several annual bursaries to students to help facilitate their SEM electives.²¹

As a junior doctor

The taster week is a two to five day period offered within the foundation programme to enable foundation year doctors to embed themselves into a specialty of interest. This is organised by the doctor and can be undertaken in SEM. One article outlines how an FY2 doctor worked alongside an SEM consultant at the 2019 European Indoor Athletics Championships in Glasgow.²³

When selecting foundation or core training rotations, doctors can think laterally and expose themselves to related areas of medicine, such as accident and emergency, rehabilitation or musculoskeletal medicine.¹³ Aside from this, interested doctors can shadow and work under SEM doctors within the hospital or team environment in their own time.

Where a career in SEM can lead

A SEM career can lead anywhere you want it to. . . . Dr Heron has been lucky enough to work in international football with both the Northern Irish and English Football Associations as well as in international cycling with the British Cycling team. Dr Heron has also worked with some of the top sport teams in the world including Team Sky cycling team and through these teams and opportunities, all over the world, including Canada, Australia, China and Japan, to name but a few. More importantly, this work allows you to work with fantastic colleagues, who motivate you to work harder, constantly wanting to learn and who have become life-long friends.

Whilst being exposed to some of the best athletes in the world, Dr Heron has continued to undertake regular weekly GP and A&E sessions as well as working in musculoskeletal triage services and undertaking research into cardiovascular disease prevention and new injection therapies for knee osteoarthritis. His research has changed the way sports are played and governed, including the assessment of concussion in cycling.^{24,25,26} Such a varied job role ensures that no two days are the same and that sport and exercise medicine, in our opinion, is the best job, not only within medicine.

CONCLUSION

Sports and Exercise Medicine is a varied, exciting and rewarding career. As a newer specialty, it offers flexibility for practitioners to define an individualised career path, which may involve assuming several different roles with multiple job titles. Budding SEM doctors can help shape the future of the specialty, with much ongoing research in the area and increasing demand for exercise interventions at a public health, population level.

REFERENCES

1. Jordan KP, Kadam UT, Hayward R, Porcheret M, Young C, Croft P. Annual consultation prevalence of regional musculoskeletal problems in primary care: an observational study. *BMC Musculoskelet Disord.* 2010; 11:144. doi: 10.1186/1471-2474-11-144
2. Joint Royal Colleges of Physicians Training Board [JRCPTB]. Sport and exercise medicine training curriculum: implementation August 2021. [monography on the Internet]. London: JRCPTB; 2021. [cited 2022 Jan 21]. Available from: <https://www.jrcptb.org.uk/specialties/sport-and-exercise-medicine>.
3. Felson DT, Lawrence RC, Dieppe PA, Hirsch R, Helmick CG, Jordan JM, *et al.* Osteoarthritis: new insights. Part 1: the disease and its risk factors. *Ann Intern Med.* 2000; 133(8):635-46.
4. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet.* 2018;392(10159):1789-858.



5. Allender S, Foster C, Scarborough P, Rayner M. The burden of physical activity-related ill health in the UK. *J Epidemiol Community Health*. 2007; 61(4):344-8.
6. Pandya T, Marino K. Embedding sports and exercise medicine into the medical curriculum; a call for inclusion. *BMC Medical Education*. 2018; 18(1):306. doi.org/10.1186/s12909-018-1422-9
7. Elton C. How to pursue a career in sports and exercise medicine? *BMJ*. 2015; 351:h4380. doi.org/10.1136/sbmj.h4380
8. O'Halloran P. My life as a GP training in sport and exercise medicine. [Internet]. London: Messly; 2017. [cited 2022 Jan 21]. Available from: <https://www.messly.com/blog/messly-specialty-interviews-sport-and-exercise-medicine>.
9. NHS Physician Higher Specialty Training Recruitment [PHST]. Sports and exercise medicine. [Internet]. London: PHST; 2022. Available from: <https://phstrecruitment.org.uk/specialties/sport-exercise-medicine/>
10. Heron N. Cardiac rehabilitation for the transient ischaemic attack (TIA) and stroke population? Using the Medical Research Council (MRC) guidelines for developing complex health service interventions to develop home-based cardiac rehabilitation for TIA and 'minor' stroke patients. *Br J Sports Med*. 2019;53(13):839-40.
11. Thompson B, MacAuley D, McNally O, O'Neill S. Defining the sports medicine specialist in the United Kingdom: a Delphi study. *Br J Sports Med*. 2004; 38(2):214-7.
12. NHS Health Education England. Person Specification 2022: sports and exercise medicine - ST3. [Internet] London: Health Education England; 2021. Available from <https://specialtytraining.hee.nhs.uk/Recruitment/Person-specifications>
13. NHS Doctors: Roles for doctors: Medicine. Sport and exercise medicine. [Internet]. London: NHS; 2022. Available from: <https://www.healthcareers.nhs.uk/explore-roles/doctors/roles-doctors/medicine/sport-and-exercise-medicine>.
14. Evans G. A career in sport and exercise medicine. *BMJ*. 2016; 355:i4336. doi: 10.1136/sbmj.i4336.
15. General Practice Elective Care Services [GPECS]. Welcome to General Practice elective care service clinics. Belfast: GPECS; 2022. Available from: <https://gpecs.easternfsu.com>.
16. Collins R. From GP to GPwSISEM Blog. [Internet]. London: Br Assoc Sports Exerc Med; 2018. Available from: <https://basem.co.uk/1713-2/>
17. British Association of Sport & Exercise Medicine [BASem]. Non-higher speciality training: Independent learning. [Internet]. Doncaster: BASem; 2022. Available from: <https://basem.co.uk/careers-training/specialist-doctors-career-pathways/non-higher-specialty-training/independent-learning/>
18. Faculty of Sport and Exercise Medicine UK. Diploma in musculoskeletal medicine. [Internet]. Edinburgh: BASEM; 2022. Available from: <https://www.fsem.ac.uk/careers-training/diploma-in-musculoskeletal-medicine/>
19. NHS Health Education England. Specialty training: competition ratios 2021. London: HEE; 2022. Available from: <https://specialtytraining.hee.nhs.uk/Competition-Ratios>.
20. NHS Health Education England. Specialty training: competition ratios 2020. London: HEE; 2022. Available from: <https://specialtytraining.hee.nhs.uk/Competition-Ratios>.
21. NHS Health Education England. Specialty training: competition ratios 2019. London: HEE; 2022. Available from: <https://specialtytraining.hee.nhs.uk/Competition-Ratios>.
22. British Association of Sport & Exercise Medicine [BASem]. USEMS Education: Electives. [Internet]. Doncaster: BASem; 2022. Available from: <https://basem.co.uk/careers-training/usems/usems-education/electives/>
23. Osborne S. A taster week in sports medicine: BJSM blog series. [Internet]. *Br J Sports Med*. London: BMJ; 2019. Available from: <https://blogs.bmj.com/bjsem/2019/04/19/a-taster-week-in-sports-medicine/>.
24. Heron N, Elliott J, Jones N, Loosemore M, Kemp S. Sports-related concussion (SRC) in road cycling: the RoadsIde head Injury assessment (RIDE) for elite road cycling. *Br J Sports Med*. 2020;54(3):127-8.
25. Elliott, J; Anderson, R; Collins, S; Heron, N. Sports-related concussion (SRC) assessment in road cycling: a systematic review and call to action. *BMJ Open Sport Exerc Med*. 2019;5(1):e000525. doi: 10.1136/bmjsem-2019-000525.
26. Swart J, Bigard X, Fladischer T, Palfreeman R, Riepenhof H, Jones N, Hero, N. Harrogate consensus agreement: Cycling-specific sport-related concussion. *Sports Med Health Sci*. 2021; 3(2): 110-4.

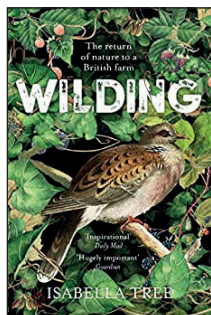


Book Case

Dr John Purvis selects 5 books that he has recently enjoyed.

WILDING. THE RETURN OF NATURE TO A BRITISH FARM.

Isabella Tree.
Picador. 2018.
ISBN-13: 978-1509805105.
Paperback.
RRP £9.99



Quite an influential book, it describes how the author and her husband inherited a large estate in Sussex that was driven close to bankruptcy by adhering to intensive farming policies and minimal payment for products from supermarkets. The couple took the decision to abandon the “wisdom” of the past 50 years and rewild the Knepp estate. Rather than doing nothing at all, this involved moving back to almost mediaeval practices such as letting longhorn cattle, deer and Tamworth pigs roam freely across their land as well as not interfering with natural drainage in marshy areas and ponds. Their neighbours thought they were mad and feared “contamination” or flooding.

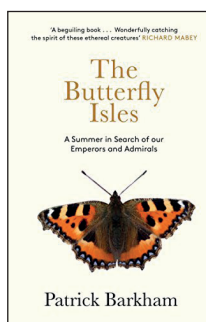
By contrast, the undrained marshy areas acted as a sump to soak up excess rainwater and the estate diversified into producing their own organic meat and dairy produce and became more than profitable. The real transformation however was in the spectacular increase in flora and fauna attracted to the wetlands, meadows and forests liberated from intensive agriculture. The estate is now a stronghold for threatened species such as Turtle doves, nightingales and the UK’s most spectacular butterfly, the Purple Emperor. Wildlife enthusiasts now flock to the estate to encounter these rare species opening a lucrative and unforeseen income stream.

A well written and informative book. Highly recommended.

And speaking of butterflies...

THE BUTTERFLY ISLES. A SUMMER IN SEARCH OF OUR EMPERORS AND ADMIRALS.

Patrick Barkham.
Granta.
Second edition
2018. ISBN-13:
978-1-78378-458-5. Paperback.
RRP £10.99.



One of my retirement projects has been to photograph all 25 species of Northern Ireland butterflies – so far I’m up to 17. I was therefore delighted to come across this book. The author was raised in the countryside but worked in the City of London for years. Feeling somewhat jaded, he embarked on a project to see all 59 species of UK butterfly in 1 season. He documents his encounters with information about each species, its history, location and environmental threats. He meets up with experts along the way to guide him to some of the rarer species and journeys over here to the Craigavon Lakes, Montiagh Moss and Murlough NT reserve to encounter Marsh Fritillary, Large Heath and a butterfly unique to Northern Ireland,

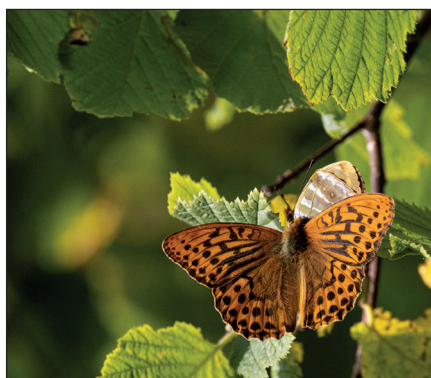


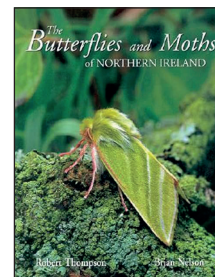
Figure 1: A male Silver Washed Fritillary (*Argynnis paphia*) at Umbra Nature Reserve, Castlerock.

the Cryptic Wood White. The book also covers the history of the Victorian era of Butterfly Collecting – the Victorian collectors called themselves “Aurelians” after the rainbow goddess of the dawn, Aurora. I guess photography is the modern version of that. Over the course of the year, he refreshes himself and his relationship with his naturalist father but

it’s funny to read how his city slicker girlfriend initially is bemused then bored and finally frustrated at his seemingly “pointless” obsession.

THE BUTTERFLIES AND MOTHS OF NORTHERN IRELAND.

Robert Thompson and Brian Nelson.
2006. National Museums Northern Ireland.
ISBN-10: 0 900761 47 4.
Paperback. Out of print, available from www.abebooks.co.uk around £50-90.



Over the last few years, I’ve made ultrasound recordings of 6 different species of bat in my back garden – what attracts so many visitors? The answer is Moths. Most of us only consider Moths when we encounter a stray inside our houses but they play an important role as pollinators and food for bats



Figure 2: A Peppered moth (*Biston betularia*) in the author’s garden.

Often used to teach natural selection in schools. During the Industrial Revolution, darker variants were better camouflaged against sooty backgrounds and became more frequent. In the post-industrial 21st century, the predominant variety is once again, this light version.

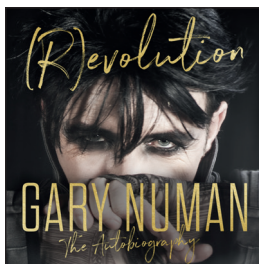
and birds. Numbers have declined dramatically over the years – if you are of a certain age, you may remember the appearance of your car windscreen after a summer night’s drive- compare that with nowadays.

This is a lavishly illustrated guide to

the 1000+ species of Moth and 25 species of Butterflies resident in NI. Each entry comprises a distribution map gleaned from sightings recorded in the Biodiversity.IE website along with notes written by QUB entomologist Brian Nelson and photographs of the more interesting varieties by Robert Thompson. One for the enthusiasts only but a superb record of the wealth of biodiversity in our land.

(R)EVOLUTION THE AUTOBIOGRAPHY

Gary Numan.
2020.
Constable.
ISBN 978-1-47213-462-2.
Hardback.
RRP £20
Signed by
Author.



I was very thoughtfully given a number of signed music autobiographies for my birthday (It had a zero in it). This was the first one I read – I was aware of Gary from his Tubeway Army days in the late 70s and the occasional brief foray into the lower end of the charts in the 80s. I have to say I really enjoyed this book. Gary had a conventional enough working-class London upbringing but probably had an Asperger's type disorder which wasn't realised until decades later. His favourite childhood toy was a wooden box built by his father, fitted with dials and knobs which turned but didn't do anything – it was perfect way for him to imagine driving cars, planes and spaceships anywhere his imagination could take him. He initially did well at school but his very rigid insistence on rules being applied fairly and knowing exactly why things had to be a certain way exasperated his teachers and he left school without qualifications. He joined a few punk bands but had a "Road to Damascus" moment when he saw a synthesiser with lots of knobs and dials at a recording studio – just like his childhood toy. With no formal musical training, he just made songs that sounded right to him and had early worldwide success with "Are Friends Electric?" and "Cars". He soon became passe and was criticised for his robotic

appearance and stilted interviews – again his underlying condition was not recognised. He struggled away for many years but built up a loyal cult following.

He never saw the point of taking drugs but suffered from significant depression for some years – he found that drug therapy for the depression zombified him and left him unable to write – he was better off without treatment and he gradually recovered.

Many other artists covered his songs and royalties from "Cars" (used by nearly every auto manufacturer and dealership in the USA) and Basement Jaxx's "Where's your head at?" (in reality, just two Numan tunes jammed together) kept him afloat.

Lately, he has been recognised as an elder statesman of industrial electropop and his dark songs of doom and destruction have become popular again. I'm hoping to see him in May when he plays in Belfast.

SALAD DAZE

Wayne Hussey.
2019. Omnibus
Press. ISBN
978-1-78760-251-9. Hardback.
RRP =£19.
Signed by
Author.



Written in a conversational style and featuring a lot more drugs than Gary Numan's book, this is mostly about the dynamics of working in a band and how having a good network of friends can lead to creative possibilities.

Born in Bristol, Wayne had quite a religious upbringing in a Mormon household. He hoped to be a footballer but seeing Marc Bolan and T-Rex perform on Top of the Pops one night changed his focus and he left home with his guitar to join the music scene in Liverpool. There were many like him looking to make names for themselves – bands would form and break up every week. Holly Johnson and Boy George were there in early versions of their later personas.

Wayne developed a reputation as a good guitarist and joined Pete Burns's "Dead or Alive" in their early goth phase, leaving before they had their "Spin you round" pop hit.

He auditioned for another famous goth band – "The Sisters of Mercy" – the audition consisted of splicing lines of amphetamine for them rather than displaying any musical talent. The band was extremely dysfunctional in the recording studio with other members not speaking to each other and the lead singer coming in at the end to record his parts over others prized work. Despite this, they all got a buzz (literally) out of playing live and touring. The squalor and sleaze of two American tours is described in detail. Eventually tensions within the band, drove Wayne out and he forms his own band – "The Mission" which goes on to great success. The book ends around the time of The Mission's formation.

Interestingly, each chapter of the book is accompanied by a downloadable Spotify playlist so you can listen to the pieces referred to or around at the time of the events in the chapter. I think The Mission are also playing Belfast in May – tempting, but I prefer Gary Numan.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Letters

CORN FLAKES IS THE CURE

Editor,

We report a case of vitamin C deficiency, otherwise known as scurvy, presenting with cutaneous findings. Vitamin C is vital for skin health and a deficiency leads to bleeding gums, poor wound healing, thickening of the stratum corneum and subcutaneous bleeding.¹ In severe deficiency there is a risk of haemarthrosis, subperiosteal haemorrhage and visceral bleeding, therefore, scurvy is a diagnosis not to be missed.¹ Vitamin C improves skin hydration and also has a role in reducing free radical formation triggered by ultraviolet ray exposure to the skin. This helps to reduce premature skin ageing and the occurrence of cutaneous squamous cell carcinoma.² Furthermore, reduction in free radicals helps to reduce the risk of atherosclerosis by preventing oxidation of low density lipoproteins.³ Scurvy can be confused with vasculitis or a coagulopathy, leading to unnecessary investigations and a delay in treatment. It is important to note the risk factors and clinical features to ensure an early diagnosis.

A 48-year old unemployed man presented to dermatology outpatients with a one year history of a recurring rash suspected to be cutaneous vasculitis. Curiously, our patient



Figure 1 Perifollicular haemorrhage and corkscrew and swan neck hairs

reported improvement in his skin changes after a spell of eating solely Kellogg's Crunchy Nut Cornflakes^a on holiday. The cereal contains 111mg ascorbic acid per 100g of cereal, amounting to 83% of the recommended daily allowance.⁴ Our patient described his rash reappearing a few months after he returned home. The patient had a history of depression, anorexia and alcohol dependence. His medication included

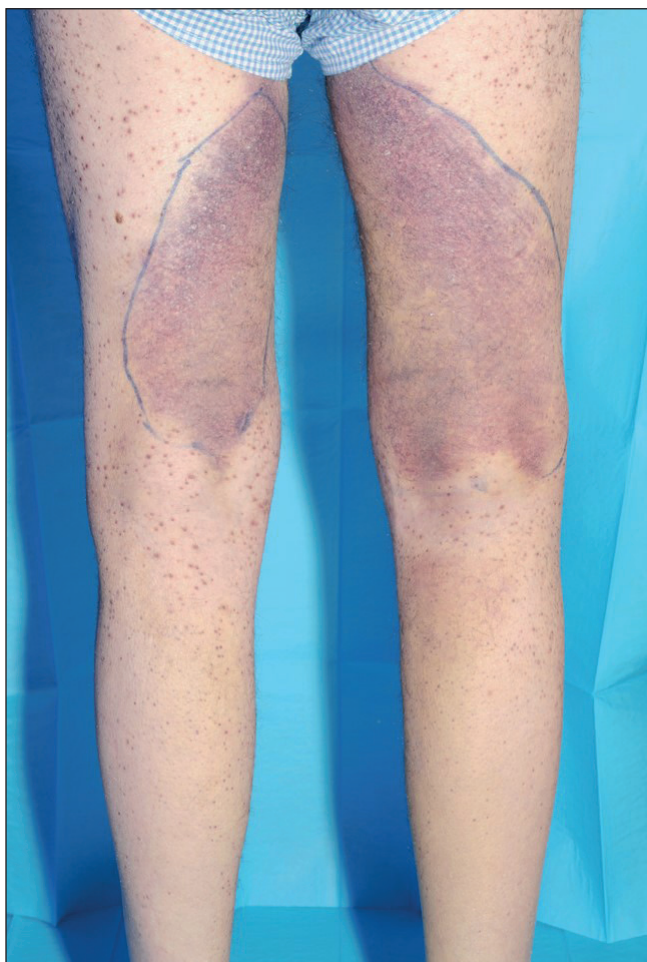


Figure 2 Ecchymoses and purpura on posterior thighs

citalopram. Examination findings included perifollicular haemorrhages, corkscrew and swan neck hairs over his arms and legs and purpura over his thighs. (Figures 1 and 2). Investigations revealed a vitamin C level of 3.2umol/l (normal range > 32umol/l), negative anti-nuclear antibodies (ANA), negative anti-neutrophil cytoplasmic antibodies (ANCA) and normal complement levels. The patient had concurrent normocytic anaemia (haemoglobin 10.8 g/dl, MCV 91 fl). Haematinics were normal. The patient was commenced on oral ascorbic acid therapy with resolution of his skin eruption within two weeks.

Vitamin C is important for collagen metabolism, therefore, a deficiency leads to degeneration of connective tissue and vasculature, hence the clinical findings of scurvy.⁵ Once treated, bruising and perifollicular haemorrhages usually resolve within two weeks, whilst corkscrew hairs take up to four weeks to normalise.⁵ The diagnosis of scurvy has been

known since ancient times, however, in 1747 Sir James Lind was the first to recognise intake of citrus fruit as prevention of the condition.⁵ It is important to note that vitamin C levels in peeled and cut fruits stored at 5°C decreases up to 25%.⁶ Scurvy is often incorrectly thought to be eradicated from developed countries, however, the prevalence of scurvy in developed countries is as much as 26%.⁷ Our patient suffered psychiatric illness, which is a reported association of scurvy. Other associations include social isolation, drug and alcohol abuse, fad diets and disorders of malabsorption.⁷

Authors:

S. R. Raichura¹ M. Nicol¹ R. Brennan¹ and D. O'Kane¹

¹Department of Dermatology, Belfast Health and Social Care Trust, Northern Ireland, UK

Conflicts of interest: None declared

Email: shyamal.raichura@belfasttrust.hscni.net

REFERENCES:

1. Hodges RE, Hood J, Canham JE, Sauberlich H, Baker EM. Clinical manifestations of ascorbic acid deficiency in man. *Am J Clin Nutr.* 1971;24(4):432-3.
2. Payette MJ, Whalen J, Grant-Kels JM. Nutrition and non-melanoma skin cancers. *Clin Dermatol.* 2010;28:650-662.
3. Steinbrecher UP, Zhang HF, Loughheed M. Role of oxidative modified LDL in atherosclerosis. *Free Rad Biol Med.* 1990;9(2):155-68.
4. Kellogg's Nutrition V1/12. Nutrition information booklet: breakfast cereals and snacks. [Monograph on the Internet]. Australia: Kellogg's; 2010 Aug [cited 2021 Nov 19]. Available from: https://www.kelloggsnutrition.com/content/dam/globalnutrition/en_AU/resources/KEL567-Nutrition%20booklet%20v%2010.pdf.
5. Leger D. Scurvy remergence of nutritional deficiencies. *Can Fam Physician.* 2008;54(10):1403-6.
6. Gil MI, Aguayo E, Kader AA. *J Agric and Food Chem.* 2006;54(12):4284-96.
7. Bhattacharyya P, Giannoutsos J, Eslick GD, Fuller SJ. Scurvy: an unrecognized and emerging public health issue in developed economies. *Mayo Clin Proc.* 2019;94(12):2594-97.

COMMUNICATING RESEARCH FINDINGS TO PATIENTS:

Comparison of readability of Patient Lay Summaries written by eight clinical disciplines of the Cystic Fibrosis (CF) Multidisciplinary Team (MDT)

Editor,

Communication of research findings to lay people including patients is vitally important. "No research about me without me" is now becoming a widely used phrase¹ and we should be doing our best to involve patients and the public in all aspects of our research from design, execution of studies through to publication and dissemination. Many journals now encourage or request lay summaries as part of the publishing process. New digital tools have been developed that can objectively score written text for its readability against established algorithms.² Readability metrics use formulae that can score or grade a text based on number of syllables per words, words per sentence or word familiarity.

A well-written Lay Summary with good readability scores may assist intended lay readers and service users, to better understand the content of Lay Summaries that may in turn improve their health literacy. Today, many disease states are managed by the multidisciplinary team (MDT). The cystic fibrosis multidisciplinary team (CF-MDT) forms an important component of CF patient care and consists of healthcare professionals from medicine, nursing, physiotherapy, dietetics, microbiology, pharmacy, psychology and social care. To date, there have been no studies which have compared the readability of patient-facing lay summaries of research findings prepared by these different disciplines within the CF MDT. It was therefore the aim of this study to compare the readability of lay summaries prepared for patients by the different CF MDT disciplines within their own subject area.

Lay summaries (n=104) were analysed from *CF Research News* (CFRN), which is an online e-resource hosted by the European Cystic Fibrosis Society (ECFS) (<https://www.ecfs.eu/publications/cf-research-news>). All lay summaries were freely available and in the public domain. Lay summaries conformed to a standard template of preparation. Research articles were selected under the eight discipline headings of: Basic Science, Clinical Trials, Epidemiology/Models of Care, Endocrinology, Microbiology, Nutrition, Psychosocial and Pulmonology. A total of 104 lay summaries were selected, comprising of 13 lay summaries from each discipline. Readability analyses of the Lay Summaries was performed as previously described.³

Analyses of readability scores across eight CF disciplines are shown in Table 1. The mean readability of lay summaries combining all disciplines was 41.1 (Flesch Reading Ease) and 10 (Flesch-Kincaid Grade Level). Nutrition had the highest readability when considering all readability scores, and microbiology consistently had the lowest readability. This may be attributed to microbiology using binomial names to identify taxonomic names of microorganisms. Binomial names are comprised of two parts, i.e. the genus name and the species name, which is used in its Latin form. Binomial names often consist of polysyllabic words e.g. *Actinobacillus actinomycetemcomitans* (6+9=15 syllables), an important causal bacterium of infective endocarditis,⁴ thus making microbiology text rich in polysyllabic words, leading to diminished readability.

With an increasingly complex burden of care in cystic fibrosis (CF), PwCF enter the *Attention Economy* for their attention relating to all aspects of their treatments. These include time requirements to read and understand patient information leaflets (PIL) that accompany all aspects of their care, including device inserts, antibiotics and more recently, CFTR medicines. CF multidisciplinary team (MDT) healthcare professionals should aim to communicate to the PwCF such information at a level that is understood and is commensurate with the PwCF's level of Health Literacy. Training and other supports should be available to empower the clinical team to communicate research findings as effectively as possible to their patients, carers, family and



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

Table 1: Differences in readability grades/scores between CF disciplines of lay summaries

Readability Measure	Lay Summary															
	Nutrition (n=13)		Basic Science (n=13)		Clinical Trials (n=13)		Endocrinology (n=13)		Psychosocial (n=13)		Epidemiology/ MoC (n=13)		Pulmonology (n=13)		Microbiology (n=13)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
FKGL*	10.3 ^c	1.5	11.2 ^a	1.2	11.3 ^b	1.4	11.7	1.1	11.7	1.4	12.2	1.5	12.4	0.9	13.9 ^{a b c}	2.0
GFI*	12.7 ^a	1.5	14.2	1.3	13.8	1.6	13.6	1.6	13.9	1.8	14.0	2.0	14.0	1.2	16.1 ^a	2.4
SMOG*	13.0 ^a	1.2	13.6	1.1	13.5	1.0	13.5	1.0	13.6	1.4	13.7	1.6	13.6	1.0	15.1 ^a	1.6
FRE*	47.2 ^a	10.2	47.6 ^b	8.0	44.3 ^c	8.9	45.2 ^d	7.4	43.6 ^e	10.5	41.7 ^f	9.7	41.1	7.4	30.5 ^{a b c d e f}	12.5
ND-C †																
Median	6.7 ^a		7.4 ^b		6.5 ^{b c d}		7.2		6.9		7.4		7.1 ^c		7.5 ^{a d}	
IQR	5.8, 7.2		6.7, 8.2		6.3, 7.1		6.1, 7.6		6.2, 7.9		6.6, 7.6		6.9, 7.3		7.0, 8.0	

MoC, models of care; SD, standard deviation; FKGL, Flesch Kincaid grade level; GFI, Gunning Fog index; SMOG, Simple Measure of Gobbledygook; FRE, Flesch reading ease; ND-C, New Dale-Chall score

Mean or median values sharing the same superscript letters in each row were significantly different.

*P values were obtained from One way ANOVA, ($P < 0.05$ was considered significant).

†P values were obtained from Mann-Whitney U tests due to non-normal distribution, ($P < 0.05$ was considered significant).

friends, in order to maximise the benefits for the patient's health literacy and disease self-management.

ACKNOWLEDGEMENTS

This project was a product of the Cystic Fibrosis Study Buddies Programme designed to enable improved "health literacy" and essential skills for life and employability in young CF adults and supported by Charitable Grants from Vertex Pharmaceuticals Inc., USA. (CG-2017-106614 & CG-2015-104576). Vertex Pharmaceuticals did not play any role in project conceptualisation, design, execution, analysis, nor any editorial role in manuscript writing or approval.

Hannah L. Anderson¹, John E. Moore^{1,2,3*} and Beverley C. Millar^{1,2,3}

¹ School of Biomedical Sciences,

Ulster University, Cromore Road, Coleraine,

Co. Londonderry, Northern Ireland, BT52 1SA, UK,

² Laboratory for Disinfection and Pathogen Elimination Studies,

Northern Ireland Public Health Laboratory, Belfast City Hospital,

Lisburn Road, Belfast, Northern Ireland, BT9 7AD, UK.

³ Northern Ireland Regional Adult Cystic Fibrosis Centre, Level 8, Belfast City Hospital, Lisburn Road, Belfast, Northern Ireland, BT9 7AB, UK,

Keywords: cystic fibrosis (CF), effective communication, health literacy, microbiology, readability, scientific communication

Northern Ireland Regional Adult Cystic Fibrosis Centre, Level 8,

Belfast City Hospital,

Lisburn Road,

Belfast, Northern Ireland, BT9 7AB, UK.

***corresponding author:** Professor John E. Moore

E-mail: jemoore@niph.dnet.co.uk

REFERENCES

1. Horobin A, Hall D. On Medicine. No research about me without me – Why researchers should welcome the patient's voice. [Internet]. Santa Clara, California: BMC Series Blog. Springer Nature. 2018 Mar. [cited 2022 Feb 4]. Available from: <https://blogs.biomedcentral.com/on-medicine/2018/03/02/no-research-about-me-without-me-researchers-welcome-patients-voice/>
2. Moore JE, Moore PJ, Millar BC. Green Eggs and Ham by Dr Seuss: employing digital tools to improve readability of patient-facing materials. *Ulster Med J.* 2022; 91(1): 50.
3. Brennan OC, Moore JE, Nutt TW, Moore PJ, Millar BC. Improving meningococcal MenACWY and 4CMenB/meningococcal group B vaccine-related health literacy in patients: Importance of readability of pharmaceutical Patient Leaflets. *J Clin Pharm Ther.* 2021;46(4):1109-16.
4. Millar BC, Moore JE. Emerging issues in infective endocarditis. *Emerg Infect Dis.* 2004;10(6):1110-6.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>). The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.

THE ULSTER MEDICAL JOURNAL

Whitla Medical Building, 97 Lisburn Road, Belfast BT9 7BL. United Kingdom.
Contact details: T/ F: (+44) 028 9097 5780 E: umj@qub.ac.uk W: www.ums.ac.uk

NOTICE TO CONTRIBUTORS

The Ulster Medical Journal is an international general medical journal with contributions from all areas of medical and surgical specialties relevant to a general medical readership. It retains a prime focus on material relevant to the health of the Northern Ireland population. The Journal is indexed on *PubMed Central* and *Index Medicus*.

The Journal's links with the Ulster Medical Society and Queens University Belfast are reflected in regular publication of Medical History and Medical Education articles. **The front cover** of the journal usually includes an image related to an article within, but the editor is keen to consider publishing images that reflect "**Ulster medical life**" in a broader context. Please contact the editor for further details.

Papers, case reports and letters should be sent to the Editor by e-mail at editor@ums.ac.uk. The preferred format is **Microsoft Word**.

Manuscripts should be accompanied by a covering letter **signed** by all the authors agreeing to publication and stating that the work has not been published elsewhere; and stating that they have been actively involved in the preparation of the paper and outlining their contribution to the paper. Any conflict of interest should be declared.

A **PDF** copy of the printed and signed covering letter is ideal for electronic submission.

A Consultant or GP Principal (or equivalent) is required to act as guarantor of the manuscript (usually as a co-author) in case of any issues that may arise after publication.

If e-mail submission is not possible, A CD or memory stick containing the manuscript, tables, images and covering letter can be sent to the Editor at: Michael Trimble, Clinical Lecturer, Centre for Medical Education, Queen's University, Belfast, Mulhouse Building, Royal Victoria Hospital, Grosvenor Road, Belfast BT12 6BJ.

Articles submitted for consideration should be typewritten in single spacing, with wide margins, preferably in Times (New) Roman 12pt font. They should be fully corrected and alterations in proof may be disallowed or charged to the authors.

Colour images and tables are encouraged and there is currently no charge for colour reproduction.

Images and tables should be included as separate high resolution .jpg or .tif files and NOT embedded in the Word manuscript file. Images should be appropriately annotated and labelled.

The editor will be pleased to advise on the preparation of manuscripts on request.

After editorial checks, all manuscripts are independently refereed. The editor may request revision to a manuscript before it goes to the referee, e.g., embedded images, annotation of unlabelled images or poor quality of English.

After peer review by the referee, a manuscript may either be accepted for publication, accepted with minor or major revisions requested within a deadline or rejected. The Referee's and Editor's decisions are final and not open to negotiation. A manuscript may not be re-submitted after rejection.

1. For full or short papers, the text should indicate the purpose of the paper, and should include an introduction, sections on materials and methods, results, and a discussion relevant to the findings. A brief factual summary/abstract should be provided at the beginning of the paper along with up to six key words. For case reports, these should be **novel** or particularly important cases and *not just good*

teaching points, with a maximum of 10 references and appropriate patient consent for publication of photographs.

2. Letters to the editor should be less than 500 words with up to 5 references and 1 table and/or figure.
3. Audits are eligible for publication as letters to the editor but will not be considered as original papers.
4. Scientific measurements should be in SI units (DN Baron. *Units, Symbols and Abbreviations. A Guide for Medical and Scientific Authors*. 5th ed. London: Royal Society of Medicine, 1994). Blood pressure may be expressed in mmHg and haemoglobin concentration as g/dl.
5. References should be restricted to those really necessary and useful. This journal uses the "Vancouver" style. See Uniform Requirements for Manuscripts Submitted to Biomedical Journals (www.icmje.org/recommendations/) for full details and advice. Text references are numerical and each article reference should include:
 1. a list of all authors when six or less (when seven or more only the first six should be listed followed by *et al*).
 2. the title of the article.
 3. the title of the journal *in italics* (abbreviated to the form published by the National Library of Medicine, www.ncbi.nlm.nih.gov/nlmcatalog/journals).
 4. the year.
 5. volume number and issue number (in brackets) **in bold**.
 6. first and last pages.
 - *Example:* Devlin LA, Price JH, Morrison PJ. Hereditary non-polyposis colon cancer. *Ulster Med J* 2005;**74**(1): 14-21.
 - Book references should give the author, title, edition, town of publication, name of publisher, year of publication, and, where appropriate, volume and page numbers.
6. Reprints can be obtained from the printers, Messrs Dorman & Sons Ltd, Unit 2, 2A Apollo Road, Boucher Road, Belfast BT12 6HP - telephone (+44) 028 9066 6700, email info@dormans-print.co.uk - who should be approached directly. For reprint information in the United States contact: International Reprint Corporation (IRC), 287 East H Street, Benecia, California, 94590 USA. Telephone (707) 746-8740, fax (707) 746-1643.
7. Fellows and Members of the Ulster Medical Society receive the journal free. Individuals may subscribe directly. Institutional subscriptions are for a calendar year. The journal has three issues per year and is published in January, May and September with a circulation of 550 hard copies. The journal contents are covered by *Current Contents/Clinical Practice*, *Index Medicus*, *Excerpta Medica*, *PubMed*, *PubMed Central*, and *Index Copernicus*. The journal is available in 16mm and 35mm microfilm and 105mm microfiche from UMI, 300 North Zeeb Road, PO Box 1346, Ann Arbor, MI 48106-1346, USA.

The journal attempts to conform to the International Committee of Medical Journal Editors (ICMJE) and authors should consult the ICMJE website for details of policies not specifically outlined below and particularly for research on animals and other ethical considerations. In addition, the journal is a member of the Committee On Publication Ethics (COPE).

Editorial

Vocation in medicine

Michael Trimble

Page 65

Review

The Role of Visual Abstracts in the Dissemination of Medical Research

Beverley C. Millar and Michelle Lim

Page 67

Clinical Paper

Is qFIT a useful tool in prioritising symptomatic patients referred with suspect colorectal cancer in the COVID-19 era?

Sarah Small, Rachael Coulson, Robert Spence, and Ian McAllister

Page 79

Review

Comparison of innovative communication approaches in nutrition to promote and improve health literacy

Hannah L. Anderson, John E. Moore and Beverley C. Millar

Page 85

Case Report

Tuberculosis Aortitis and Mycotic Pseudoaneurysm of the Infra-renal Aorta after Intravesicular BCG Therapy

Nathan Gamble, Robert Blair, Sam Gray, Michael Hunter, Denis Harkin

Page 92

Clinical Paper

Metastasis of Renal Cell Carcinoma to the Stomach Twenty One Years from Initial Diagnosis

Stuart McIlwaine, Mark Haynes, Neal Morgan, Rajeev Shah, James Doyle

Page 95

The Desmond Whyte Lecture

A Golden age and the Floating Man: Ireland, Avicenna and the Canon of Medicine

Barry Kelly

Page 98

Medical History

J.A. Lindsay's Tonics and Tinctures for Cardiac Care (1889-1904)

Tracy Freudenthaler

Page 104

Curiositas

Page 109

So you want to be a

"Sports and Exercise Medicine Physician?"

Michael McLarnon, Neil Heron

Page 111

Book Case

Page 115

Letters

Page 117

Medical Biology Centre, Queen's University Belfast

© 2021 by James Armstrong, FormWorkDesigns.

James was born in Belfast, educated at RBAI and is currently reading Architecture at the University of Edinburgh. He produces original prints of architectural and landscape subjects, mainly from Northern Ireland and Scotland, but also undertakes commissions.

Contact: Formwork.inquiries@gmail.com

