Supplementary File 1 : Study Protocol

Background

Early detection of disease is gaining considerable attention worldwide.[1] Enthusiasm for early detection is displayed by the increasing interest in advances in diagnostic technology, screening programmes, innovations in biomarkers, and "P4 medicine" (predictive, preventive, personalised, and participatory).[1-3] In fact, testing in medicine is increasingly aimed at apparently healthy people to identify those at an increased risk of a disease or disorder.[4] This communicates one message: early detection is a good thing.[1]

However, there is mounting evidence that unnecessary and/or excessive testing can harm healthy people, and the quest for ever-earlier detection of disease can lead to overdiagnosis. Overdiagnosis happens when people are diagnosed in ways that do not benefit them or that can do more harm than good.[5,6] Although an exact definition of overdiagnosis remains the subject of debate, particularly in the context of non-cancer conditions, overdiagnosis can be considered to occur when persons are labelled with a technically correct diagnosis that does not improve health outcomes.[7,8] Overdiagnosis is a major global challenge to health system sustainability and human health and strategies to reduce overdiagnosis are urgently needed.[9]

Many possible drivers of overdiagnosis have been documented.[9] One major driver is the promotion (to clinicians and the public) of increasingly sensitive tests.[9] These can lead to detection of "abnormalities", which may be of uncertain clinical significance. Tests being increasingly promoted to the healthy include the Apple Watch for the early detection of atrial fibrillation, liquid biopsies and artificial intelligence for the early detection of cancer and Alzheimer's disease, and 3D mammography for the early detection of breast cancer.[4] Poor quality media reporting has been highlighted as a strong driver of this promotion.[9] Uncritical media coverage of the benefits and breakthrough of new tests, without consideration of their potential downsides or harms, potentially contributes to a more general lack of awareness about the potential harms of getting tested when healthy. In fact, research has shown that only a small proportion of people are knowledgeable about overdiagnosis.[10] Further, patients (and clinicians) overestimate the benefits of testing, while underestimating the harms.[11,12] Given the powerful role that media can play in influencing public health beliefs and behaviours, strategies to improve media reporting of medicine are needed.[9]

There are concerns that biased media reporting may be exacerbated by the increasingly changing media landscape, such as the rising influence of social media and the decline of the traditional consumption patterns of mainstream news media.[13] With the development of a more fragmented media context there is the increasing diminution of the role of specialist reporters with resulting loss of baseline technical knowledge, gatekeeping and thoughtful, investigative health journalism.[13] This presents a major challenge to the communication of complex concepts like overdiagnosis. Indeed, previous studies on the media have identified evidence of exaggeration,[14,15] inaccurate media coverage of published scientific papers,[16,17] overstating of

benefits of treatments, downplaying of harms[14,18] and failure to report important conflicts of interest of the experts cited in the story.[18]

Poor media coverage of medicine is not an insignificant issue; it can influence how the public perceives the risk of health services and how patients make treatment decisions.[4] For example, media coverage about the celebrity Kylie Minogue's self-referral mammogram bookings led to a 20-fold increase in media coverage about breast cancer and a 40% increase in mammogram bookings during the 2-week peak after the interview. Six weeks later media coverage was still up by 30%.[19]

While much research has examined how the media frames different health issues, very little research has examined the experiences of journalists and attempted to identify obstacles that hinder journalists from higher quality reporting, and elucidate possible strategies for addressing these. Further, no study has yet examined journalists knowledge and views about the increasing problem of overdiagnosis and what this may mean for media reporting of medicine. Also, many media outlets are inundated with sometimes conflicting health information from companies, researchers, institutions, the government and consumers and it would be interesting to explore how they deal with this deluge of information. Furthermore, there is little or no specialised training available for journalists who are expected to interpret often complicated statistics like relative and absolute risks. While there are guidelines available for journalists on how to responsibly report on health matters, journalists have received very little support in the implementation of these guidelines.

It is very important to examine the experiences and perceptions of journalists regarding medical reporting in a time of increasing recognition of the threats from overdiagnosis and too much medicine more generally. Identifying barriers and potential solutions to good medical reporting will help inform the development of an intervention to improve both journalists' confidence and capacity to report more responsibly on medical tests and/or treatments and the problem of overdiagnosis.

This project aims to explore journalists' views on media reporting of medicine (particularly medical tests), and barriers and solutions to improving media reporting in a time of overdiagnosis and too much medicine.

Methods and analysis

Ethical approval

We will seek ethical approval from the University of Sydney Human Research Ethics Committee.

Study design

We will conduct a qualitative study using semi-structured face-to face (or telephone as applicable) interviews. Individual interviews will be conducted to allow participants to speak in confidence about their views and experiences, and to ensure they are not influenced by other journalists with different levels of experience or that work in different settings/specialities. This study will be designed and reported according to the Consolidated Criteria for Reporting Qualitative Research (COREQ).

Participants

We will recruit 15-20 Australia-based journalists. We will purposively recruit journalists with different characteristics (e.g. type of media- TV, print, social media) and levels of experience (e.g. years active, speciality). Both specialist medical journalists and non-medical journalists will be included. Examples of potential media organisations include the Guardian, News Ltd, ABC, Nine-Fairfax, Nine-TV (or 7 TV), and The Conversation.

To be eligible, participants need be currently working as journalist in Australia, be able to communicate in English (both orally and over email), and be able to give informed consent. Ability to read and understand English are key inclusion criteria for the proposed study because the interview will be conducted in English. There will be no restriction on the age or gender of participants.

Recruitment

We will recruit potential participants through a number of different avenues, where needed. There is journalism expertise in the author team (Ray Moynihan) and personal contacts will play a role in the initial development of a list of potential participants to contact. From here we will use an active 'snowball' recruitment technique by asking participating journalists to suggest other eligible journalists they believe would be interested in being involved. We will then access their publicly available contact information to approach them about the study. If needed, the Australian Science Media Centre and Cochrane Australia will be asked to support recruitment working with their networks.

Data collection

Interviews will be conducted face-to-face at Sydney School of Public Health (The University of Sydney), or via Skype/Zoom/telephone if the participant prefers, by a researcher with experience in conducting qualitative interviews. An interview schedule will be developed and discussed among the team members. Interview questions will address the following topics: journalist background, journalist training, interest in reporting on health and medicine, positive and negative experiences of reporting on health and medicine, definition of scientific quality in reporting, views on the changing media landscape, knowledge of overdiagnosis and too

much medicine, barriers to quality reporting of medical tests, solutions for improving media reporting of medical tests, openness to a training intervention and views on the content of an intervention package.

Interviews will last ~60 minutes and will be audio-recorded and transcribed verbatim for analysis. The interviewer will also take notes during the interview to highlight key themes emerging from the interview and direct further questioning (e.g. explore a point raised by the participant). This information will also enable the interviewer to summarise back to the participant at the end of the interview and give them an opportunity to provide further information.

Data analysis

The interview data will be analysed using thematic framework analysis. Framework analysis is a well-accepted method for analysing qualitative data from interviews and is conducted in 5 stages. Stage 1 (familiarisation): the interview will be transcribed verbatim (from audio recordings) by the researcher who conducted the interview. Stage 2 (identifying a thematic framework): transcripts and interview notes will be analysed numerous times to identify codes that could be linked together by related concepts. A second researcher will double code half of the transcripts to check for reliability of the framework. Disagreements will be resolved through discussion. Concepts will then be grouped into broader themes and sub-themes. Stage 3, 4 & 5 (indexing, charting and mapping, interpretation): data will be summarised and charted using Microsoft Excel, and the mapping of themes and sub-themes will be iterative. This analysis will be conducted primarily by one researcher, with input from the research team in the development of the codes and themes.

References

1. Hofmann B, Skolbekken J-A. Surge in publications on early detection. *BMJ* 2017;357:j2102.

2. Mandl KD, Manrai AK. Potential Excessive Testing at Scale: Biomarkers, Genomics, and Machine Learning. *Jama* 2019;321(8):739-40.

3. Flores M, Glusman G, Brogaard K, Price ND, Hood L. P4 medicine: how systems medicine will transform the healthcare sector and society. Personalized medicine 2013 ;10(6):565-76.

4. O'Keeffe M, Barratt A, Maher C, Zadro J, Fabbri A, Jones M, Moynihan R. Media Coverage of the Benefits and Harms of Testing the Healthy: a protocol for a descriptive study. BMJ open 2019 1;9(8):e029532.

5. Brodersen J, Kramer BS, Macdonald H, et al. Focusing on overdiagnosis as a driver of too much medicine. BMJ 2018;362.

6. Moynihan R, Doust J, Henry D. Preventing overdiagnosis: how to stop harming the healthy. BMJ 2012;344:e3502.

7. Bell KJL, Doust J, Glasziou P, et al. Recognizing the potential for overdiagnosis: are high-sensitivity cardiac troponin assays an example? Ann Intern Med 2019;170:259–61.

8. Carter SM, Degeling C, Doust J, et al. A definition and ethical evaluation of overdiagnosis. J Med Ethics 2016;42:705–14.

9. Pathirana T, Clark J, Moynihan R. Mapping the drivers of overdiagnosis to potential solutions. BMJ 2017;358.

10. Moynihan R, Nickel B, Hersch J, et al. Public opinions about overdiagnosis: a national community survey. PLoS One 2015;10:e0125165.

11. Hoffmann TC, Del Mar C. Patients' Expectations of the Benefits and Harms of Treatments, Screening, and Tests. JAMA Intern Med 2015;175:274–86.

12. Hoffmann TC, Del Mar C. Clinicians' Expectations of the Benefits and Harms of Treatments, Screening, and Tests. JAMA Intern Med 2017;177:407–19. 26.

13. Medew J, Moynihan R. Improving coverage of medical research in a changing media environment. Can Med Assoc J 2017;189:E55 1–E552. 27.

14. Moynihan R, Bero L, Ross-Degnan D, et al. Coverage by the news media of the benefits and risks of medications. N Engl J Med 2000;342:1645–50. 28.

15. Cassels A, Hughes MA, Cole C, et al. Drugs in the news: an analysis of Canadian newspaper coverage of new prescription drugs. CMAJ 2003;168:1133–7. 29.

16. Goldacre B. Preventing bad reporting on health research. BMJ 2014;349:g7465. 30. 1

17. Almomani B, Hawwa AF, Goodfellow NA, et al. Pharmacogenetics and the print media: what is the public told? BMC Med Genet 2015;16:32

18. Moynihan RN, Clark J, Albarqouni L. Media Coverage of the Benefits and Harms of the 2017 Expanded Definition of High Blood Pressure. JAMA internal medicine. 2019 1;179(2):272-3.

19. Chapman S, McLeod K, Wakefield M, et al. Impact of news of celebrity illness on breast cancer screening: Kylie Minogue's breast cancer diagnosis. Med J Aust 2005;183:247–50.