

# Too Much Healthcare: The Harmful Combination of Overdiagnosis and Medical Overuse, Told and Untold Stories

Anat Gaver MD<sup>1,2</sup>

<sup>1</sup>Department of Family Medicine, Dan and Tel Aviv Districts, Clalit Health Services, Ramat Gan, Israel

<sup>2</sup>Department of Family Medicine, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

## ABSTRACT

Too much healthcare is prevalent, wasteful, and harmful. It consists of two separate phenomena: overdiagnosis and overuse. Overdiagnosis is the labeling of a person with a disease or abnormal condition that would not have caused the person harm if left undiscovered. Individuals derive no clinical benefit from overdiagnosis, although they may experience physical, psychological, or financial harm. It has been found that 15–30%, 20–50%, 0–67%, and 50–90% of people with screen detected breast, prostate, lung, and thyroid cancer, respectively, are overdiagnosed. Since many screening tests have trade-off between benefit and harm, a shared decision-making approach is essential. Incidental findings are very common and may also cause overdiagnosis. Overdiagnosis is recognizable in populations and not at the individual level. However, overuse is recognizable at the level of the individual practitioner. *Choosing Wisely*, an intervention directed at reducing low value care, now faces the challenge of developing interventions that go beyond recommendations. While some of the drivers of overdiagnosis and overuse are similar, different and parallel strategies are needed in order to reduce them. This is one of the major challenges to our health care system.

IMAJ 2022; 24: 399–402

**KEY WORDS:** low-value care, overdiagnosis, overuse, screening, shared decision making

The understanding that too much healthcare is prevalent, wasteful, and harmful is well-established globally [1] as well as in Israel [2]. The last decade has seen an exponential growth in the medical literature published in the field.

Initiatives such as *Preventing Overdiagnosis* [3], *Choosing Wisely*, *BMJ's Too Much Medicine*, *JAMA's Less Is More* series, and other articles in leading medical journals, lead the discourse.

To characterize, understand, and offer solutions to the too much healthcare phenomenon, a clarification of the terms being used is essential [4]. The main important distinction is between overdiagnosis and overuse. Obviously, the paths of overdiagnosis and overuse might merge, thus

amplifying the harms associated with each of them. An example might be when an unneeded test (i.e., overuse) detects a tumor that would not have caused the person harm if left undiscovered (i.e., overdiagnosis).

## OVERDIAGNOSIS

According to the official Medical Subject Headings (MeSH) definition [5], overdiagnosis is defined as the labeling of a person with a disease or abnormal condition that would not have caused the person harm if left undiscovered. Individuals derive no clinical benefit from overdiagnosis, although they may experience physical, psychological, or financial harm.

There are two other sources of overdiagnosis that are not the focus of this article: creating new diagnoses by medicalizing ordinary life experiences and expanding existing diagnoses by lowering thresholds or widening criteria without evidence of improved outcomes.

There is an important distinction between overdiagnosis and false positive. A false positive test result is followed by more accurate testing, which eventually rules out the initial test result. In contrast, overdiagnosis is a correct diagnosis according to the diagnostic or pathologic criteria of the disease.

The increased ability to scrutinize the body by advanced tests and imaging techniques enables detecting abnormalities more often and earlier than ever before. Contrary to the common belief that early detection is always better, there are many examples showing that early diagnosis is sometimes harmful [6].

It is now recognized that some diseases have a large reservoir of pre-symptomatic or asymptomatic abnormalities that look exactly the same as the clinical disease (e.g., under a microscope or by imaging) according to the proper diagnostic criteria but do not behave the same and would not have caused the person harm if left undiscovered. Overdiagnosis is

seen in malignant diseases such as thyroid, kidney, prostate, breast, lung, and skin (melanoma) cancers [7] as well as in other conditions such as chronic kidney disease, pulmonary embolism diseases, and mental disorders.

Clearly, the overdiagnosed do not need treatment, but since it is impossible to distinguish between overdiagnosed and non-overdiagnosed conditions, as they both look the same, everyone is treated. Obviously, people do not get any benefit from treatment for diseases that would not have caused them harm if left undiscovered. Nevertheless, they may experience harm from side effects and consequences of the treatment, and by the mere labeling of a serious diagnosis. That harm may be physical, psychological, or financial, and it may affect a patient's family.

There are two main routes leading to overdiagnosis: the intentional route of screening and the unintentional one of incidental findings.

### SCREENING AND OVERDIAGNOSIS

Screening aims at diagnosing a disease in its asymptomatic phase. An ideal screening test would detect all the people who would eventually become symptomatic, but earlier. In addition, there should be a proven benefit from treatment at this early stage. However, some screening tests detect more people than anticipated [8]. In other words, many screening tests detect not only people who would eventually present with the disease and therefore benefit from its early detection, but also people who would never show signs of the disease if left undiscovered. Overdiagnosis can be estimated using different research methods. Each has its own strengths and limitations [9].

Unfortunately, overdiagnosis is the rule rather than the exception for many cancer screening tests. A prominent example is a 15-fold increase in the incidence of thyroid cancer seen in South Korea after starting screening, while mortality from the disease has not changed. The graph showing this gap is regarded as *pathognomonic* to overdiagnosis [10].

Another example is lung cancer screening in low-risk Taiwanese women, most of whom have never smoked. Lung cancer incidence increased more than 6-fold, while there was no change in mortality and in the incidence of late-stage tumors. The epidemiologic signature of rising incidence and stable mortality suggests overdiagnosis [11]. Even screening tests with proven benefits may include, alongside the benefits, a certain magnitude of overdiagnosis.

In prostate cancer screening, a small decrease in prostate cancer mortality has been achieved at the cost of numerous overdiagnosed men presenting with significant consequences of treatments [12]. The overdiagnosis rate is 20–50% of men with screen-detected prostate cancer [13].

Breast cancer screening is an apparent example for trade-off between benefit and harm [14], with overdiagnosis accounting for between 15% [15] and 30% [16] of screening detected breast cancers. Since the debate about screening in general and breast cancer screening in particular has the potential to become

emotional [17], it is important to keep in mind that, “discussing overdiagnosis is good science, not an accusation of malpractice. It is the nature of science to change. A scientific attitude entails skepticism and openness to questioning” [18].

### TOLD AND UNTOLD STORIES OF SCREENING AND OVERDIAGNOSIS

The *Popularity Paradox* occurs when a screening test with high rates of overdiagnosis is seen as being successful. The higher the rate of overdiagnosis, the greater is the perceived benefit, as more people are “cured”. The widespread survivor stories drive more people to request the screening test, which feeds the vicious cycle of overdiagnosis.

Personal stories expressing gratitude to the practitioner who had recommended a screening test that discovered an asymptomatic disease and therefore saved a life are common.

Those survivor stories are supported and reinforced by extremely positive social attitudes toward screening [19] by financial, political, and professional interests [20]; by physician innumeracy and misunderstanding of

statistics that may stimulate enthusiasm about screening [21]; by wishful thinking; and by fears of both patients and doctors [22]. All of these attitudes are strong drivers of overdiagnosis.

The inverse narrative, which involves regret about taking the screening test, about being potentially overdiagnosed, and about enduring consequences of treatment for a disease that might not have caused any harm if left undiscovered is rarely heard, if at all. However, according to the rates of overdiagnosis, this untold narrative is the true story of 15–30%, 20–50%, 0–67%, and 50–90% of people with screen detected breast [15,16], prostate [13], lung [23], and thyroid cancer [24], respectively.

While we can estimate the rate of overdiagnosis of a specific disease, it is not possible when looking at individuals with that disease to affirm whether or not they are overdiagnosed. This situation makes overdiagnosis difficult to grasp, to connect with, and to share personal stories about.

### SHARED DECISION-MAKING ABOUT SCREENING

For those screening tests that have both benefit and harm, a shared decision-making process is essential to avoid both post-factum regret and unrealistic expectations. The complete information about the benefits and the harms, among which is overdiagnosis, should be presented to patients when offered screening. Current guidelines recommend shared decision-making for a few screening tests, but it rarely happens properly in practice [25].

The occurrence of a substantial overdiagnosis, as well as the finding that screening is having only a small effect on the rate of death from breast cancer, while most of the reduced death rate is due to improved treatments [26], is supporting the call

### OVERDIAGNOSIS IS DERIVED BY SCREENING AND BY INCIDENTAL FINDINGS

### SCREENING IS A TRADE-OFF BETWEEN BENEFITS AND HARMS, ONE OF WHICH IS OVERDIAGNOSIS; THEREFORE, SHARED-DECISION MAKING IS ESSENTIAL

for shared decision-making also about breast cancer screening [27] instead of unbalanced promotion of screening [28]. Independent reviews of breast screening in the United Kingdom, Switzerland, and France [29] highlighted the need for complete and balanced information and acknowledged overdiagnosis as a serious harm. Evidently, these recommendations differ from the common practice in the United States and Israel.

**INCIDENTAL FINDINGS**

Incidental findings, discovered on imaging performed for an unrelated reason, are another route leading to overdiagnosis. Resolution of imaging tests is continually improving and their utilization is increasing, both of which make incidental findings very common. According to an umbrella review of systematic reviews [30], tests that had the highest prevalence of incidentalomas were computed tomography of the chest (45%), computed tomography colonoscopy (38%), and cardiac MRI scans (34%), MRI of the spine (22%), and MRI of the brain (22%).

The major financial and health consequences and the unavoidable anxiety caused by incidental findings turn many people into VOMIT: victims of modern imaging technology, according to a catchy acronym [31]. The contribution of incidental findings to overdiagnosis was demonstrated in thyroid cancer [32] and kidney cancer [33]. Novel strategies to reduce incidental findings and the resulting overdiagnosis [34] should be considered and evaluated.

**OVERUSE**

Medical overuse is excessive, or unnecessary, utilization of health services. Overuse has two major components: over testing and over treatment.

Overuse is linked to low-value care medical services, such as tests and procedures that should not be performed given their potential for harm. The terms overuse and low-value care are used interchangeably in this review.

The notion that low-value care might cause both short- and long-term harm, and the concept of an overuse cascade is plausible to practitioners and easily demonstrated [35], although overuse might be difficult to measure and has some gray zones [36].

Overdiagnosis is recognizable in populations and not at the individual level. It is not possible to affirm whether an individual who was given a certain diagnosis was overdiagnosed. The case is different with the phenomenon of overuse. Hence, interventions aimed to reduce overuse at the level of the consultation, i.e. by an individual practitioner, when taking care of an individual patient, may be helpful.

**THE CHOOSING WISELY CAMPAIGN**

The Choosing Wisely campaign, initiated by the American Board of Internal Medicine (ABIM) Foundation in 2012, gener-

ates lists of items that “providers and patients should question. The campaign involves 80 specialty societies and more than 600 items in the United States, and has extended to more than 20 countries worldwide, including Canada, the United Kingdom, Germany, Japan, Australia, and Israel. Choosing Wisely in Israel [37], initiated by the Israeli Medical Association, involves 13 scientific associations and has produced 72 evidence-based recommendations to reduce overuse and low-value care.

Choosing Wisely has been criticized [38] for picking up the low-hanging fruits and avoiding recommendations that might reduce overuse of lucrative procedures, for variations in the level of evidence of its recommendations and for being toothless.

Nevertheless, Choosing Wisely has contributed to a meaningful change in the culture of medicine. It now faces the challenge of developing interventions that go beyond recommendations to actually reduce the use of low-value care [39]. Multi-component interventions rather than single-component

ones, and targeting clinicians rather than patients, are the most effective types of interventions [40]. Further research on the implementation

of the recommendations and de-implementation of low-value medical services is desperately needed.

**CONCLUSIONS**

The idea of too much health care has two major components: overdiagnosis and overuse. Overuse of a screening test by extending screening to a lower risk population or adopting a screening test without insisting on evidence is especially harmful resulting in overdiagnosis and turning healthy people into sick ones unnecessarily. While some of the drivers of overdiagnosis and overuse are similar, different and parallel strategies are needed in order to reduce them. This is one of the major challenges to our health care system.

**Correspondence**

**Dr. A. Gaver**  
 Dept. of Family Medicine, Dan and Tel Aviv Districts, Clalit Health Services, Ramat Gan, Israel  
**Phone:** (972-3) 738-1216  
**Fax:** (972-3) 738-1215  
**email:** anatgaver@clalit.org.il

**References**

1. Shrank WH, Rogstad TL, Parekh N. Waste in the US health care system: estimated costs and potential for savings. *JAMA* 2019; 322 (15): 1501-9.
2. Israel Medical Association. Position Paper January 2017. Prevention of overdiagnosis and over-treatment - position paper of the company for the prevention of over-diagnosis and over-treatment, Institute of Quality in Medicine [Available from [https://www.ima.org.il/userfiles/image/Ne86\\_meniatlvhun.pdf](https://www.ima.org.il/userfiles/image/Ne86_meniatlvhun.pdf)]. [Accessed 13 June 2022]. [Hebrew].
3. Dartmouth Institute for Health Policy and Clinical Practice. Preventing overdiagnosis: winding back from the harms of too much medicine. [Available from <https://www.preventingoverdiagnosis.net/>]. [Accessed 13 June 2022].

4. Brodersen J, Schwartz LM, Heneghan C, O'Sullivan JW, Aronson JK, Woloshin S. Overdiagnosis: what it is and what it isn't. *BMJ Evid Based Med* 2018; 23 (1): 1-3.
5. Woloshin S, Kramer B. Overdiagnosis: it's official. *BMJ* 2021; 375: n2854.
6. Welch G, Schwartz L, Woloshin S. Overdiagnosed: making people sick in pursuit of health. Boston: Beacon Press, 2011.
7. Welch HG, Kramer BS, Black WC. Epidemiologic signatures in cancer. *N Engl J Med* 2019; 381 (14): 1378-86.
8. Welch HG, Black WC. Overdiagnosis in cancer. *J Natl Cancer Inst* 2010; 102 (9): 605-13.
9. Ripping TM, Ten Haaf K, Verbeek ALM, van Ravesteyn NT, Broeders MJM. Quantifying overdiagnosis in cancer screening: a systematic review to evaluate the methodology. *J Natl Cancer Inst* 2017; 109 (10).
10. Ahn HS, Kim HJ, Welch HG. Korea's thyroid-cancer "epidemic"--screening and overdiagnosis. *N Engl J Med* 2014; 371 (19): 1765-7.
11. Gao W, Wen CP, Wu A, Welch HG. Association of computed tomographic screening promotion with lung cancer overdiagnosis among Asian women. *JAMA Intern Med* 2022; 182 (3): 283-90.
12. Welch HG, Albertsen PC. Reconsidering prostate cancer mortality - the future of PSA screening. *N Engl J Med* 2020; 382 (16): 1557-63.
13. Fenton JJ, Weyrich MS, Durbin S, Liu Y, Bang H, Melnikow J. Prostate-specific antigen-based screening for prostate cancer: evidence report and systematic review for the US Preventive Services Task Force. *JAMA* 2018; 319 (18): 1914-31.
14. Summary of the committee's recommendations for examining the plan: National Breast Cancer Diagnosis in Israel [Available from [https://www.health.gov.il/NewsAndEvents/SpokesmanMessages/Documents/10022019\\_1\\_1.pdf](https://www.health.gov.il/NewsAndEvents/SpokesmanMessages/Documents/10022019_1_1.pdf)]. [Accessed 1 February 2019]. [Hebrew].
15. Ryser MD, Lange J, Inoue LYT, et al. Estimation of breast cancer overdiagnosis in a U.S. breast screening cohort. *Ann Intern Med* 2022; 175 (4): 471-8.
16. Bleyer A, Welch HG. Effect of three decades of screening mammography on breast cancer incidence. *N Engl J Med* 2012; 367: 1998-2005.
17. Quanstrum KH, Hayward RA. Lessons from the mammography wars. *N Engl J Med* 2010; 363 (11): 1076-9.
18. Carter SM, Barratt A. What is overdiagnosis and why should we take it seriously in cancer screening? *Public Health Res Pract* 2017; 27 (3): 2731722.
19. Schwartz LM, Woloshin S, Fowler FJ Jr, Welch HG. Enthusiasm for cancer screening in the United States. *JAMA* 2004; 291 (1): 71-8.
20. Heath I. Overdiagnosis: when good intentions meet vested interests--an essay by Iona Heath. *BMJ* 2013; 347: f6361.
21. Wegwarth O, Schwartz LM, Woloshin S, Gaissmaier W, Gigerenzer G. Do physicians understand cancer screening statistics? A national survey of primary care physicians in the United States. *Ann Intern Med* 2012; 156 (5): 340-9.
22. Heath I. Role of fear in overdiagnosis and overtreatment--an essay by Iona Heath. *BMJ* 2014; 349: g6123.
23. Jonas DE, Reuland DS, Reddy SM, et al. Screening for lung cancer with low-dose computed tomography: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA* 2021; 325 (10): 971-87.
24. Vaccarella S, Franceschi S, Bray F, Wild CP, Plummer M, Dal Maso L. Worldwide thyroid-cancer epidemic? The increasing impact of overdiagnosis. *N Engl J Med* 2016; 375 (7): 614-7.
25. Brenner AT, Malo TL, Margolis M, Elston Lafata J, James S, Vu MB, Reuland DS. Evaluating shared decision making for lung cancer screening. *JAMA Intern Med* 2018; 178 (10): 1311-16.
26. Bleyer A, Welch HG. Effect of three decades of screening mammography on breast cancer incidence. *N Engl J Med* 2012; 367: 1998-2005.
27. Keating NL, Pace LE. Breast cancer screening in 2018: time for shared decision making. *JAMA* 2018; 319 (17): 1814-15.
28. Woloshin S, Schwartz LM. How a charity oversells mammography. *BMJ* 2012; 345: e5132.
29. Barratt A, Jørgensen KJ, Autier P. Reform of the national screening mammography program in France. *JAMA Intern Med* 2018; 178 (2): 177-8.
30. O'Sullivan JW, Muntinga T, Grigg S, Ioannidis JPA. Prevalence and outcomes of incidental imaging findings: umbrella review. *BMJ* 2018; 361: k2387.
31. Hayward R. VOMIT (victims of modern imaging technology)—an acronym for our times. *BMJ* 2003; 326: 1273.
32. Colbeth HL, Genere N, Hall CB, et al. Evaluation of medical surveillance and incidence of post-September 11, 2001, thyroid cancer in World Trade Center-exposed firefighters and emergency medical service workers. *JAMA Intern Med* 2020; 180 (6): 888-95.
33. Welch HG, Skinner JS, Schroek FR, Zhou W, Black WC. Regional variation of computed tomographic imaging in the United States and the risk of nephrectomy. *JAMA Intern Med* 2018; 178 (2): 221-7.
34. Oren O, Kebebew E, Ioannidis JPA. Curbing unnecessary and wasted diagnostic imaging. *JAMA* 2019; 321 (3): 245-6.
35. Korenstein D, Chimonas S, Barrow B, Keyhani S, Troy A, Lipitz-Snyderman A. Development of a conceptual map of negative consequences for patients of overuse of medical tests and treatments. *JAMA Intern Med* 2018; 178 (10): 1401-7.
36. Brownlee S, Chalkidou K, Doust J, et al. Evidence for overuse of medical services around the world. *Lancet* 2017; 390: 156-68.
37. Israel Medical Association. Choosing Wisely. [Available from <http://www.choosingwisely.org.il/StaticPage/10590>]. [Accessed 13.6.22]. [Hebrew].
38. Rourke EJ. Ten years of choosing wisely to reduce low-value care. *N Engl J Med* 2022; 386 (14): 1293-5.
39. Levinson W, Born K, Wolfson D. Choosing Wisely Campaigns: a work in progress. *JAMA* 2018; 319 (19): 1975-6.
40. Iff BQ, Avanceña ALV, Hirth RA, Lee SD. The impact of Choosing Wisely interventions on low-value medical services: a systematic review. *Milbank Q* 2021; 99 (4): 1024-58.

### Capsule

## Establishment and recall of SARS-CoV-2 spike epitope-specific CD4+ T cell memory

Using a novel HLA-DRB1\*15:01/S751 tetramer to track spike-specific CD4+ T cells, **Wragg** and colleagues show that primary infection or vaccination induces robust S751-specific CXCR5- and cTFH cell memory responses. Secondary exposure induced recall of CD4+ T cells with a transitory CXCR3+ phenotype, and drove expansion of cTFH cells transiently expressing ICOS, CD38 and PD-1. In both contexts, cells exhibited a restricted T cell antigen receptor repertoire, including a highly public clonotype and considerable clonotypic overlap between

CXCR5- and cTFH populations. Following a third vaccine dose, the rapid re-expansion of spike-specific CD4+ T cells contrasted with the comparatively delayed increase in antibody titers. Overall, the authors demonstrate that stable pools of cTFH and memory CD4+ T cells established by infection and/or vaccination are efficiently recalled upon antigen re-exposure and may contribute to long-term protection against SARS-CoV-2.

*Nature Immunol* 2022; 23: 768  
Eitan Israeli