Overutilization of Imaging Tests and Healthcare Fairness

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Abstract

The aim of this chapter is to discuss the phenomenon of overutilization of imaging tests with respect to healthcare fairness. Before entering the discussion of fairness, we will briefly outline the concept of overutilization, and the scope and drivers of the phenomenon. We will end the chapter by indicating some potential solutions to combat overutilization of imaging tests.

Keywords

Medical imaging
Overutilization
Fairness
Ethics

8.1. Introduction

Overutilization of radiological examination is not a new concern. In fact, it has been addressed in scientific literature for at least 4 decades (Hall 1976; Abrams 1979). One reason for this is the fascination for the technology that enable us to see pathologic processes directly (Kevles 1997). The radiologic aphorism of: “One look is worth a thousand listens” (Gunderman 2005), reduced the role of history taking, external signs and physical examination of the patient as diagnostic tools, in favour of imaging examinations. X-ray examinations were

reported to be “regularly performed when an accurate diagnosis can be made with the naked eye, ear or finger” (McClenahan 1970). Throughout the latest decades, the development in medical imaging technologies is overwhelming. This technological progress reinforces the powerful belief that “the body can be simply seen through and the diseases recognized by the doctor’s impartial gaze” (Lalumera et al. 2019). Unfortunately, this is a false belief, as imaging tests are neither immediate nor infallible, but the illusion that with a PET or a CT scan doctors directly see the disease may explain why overutilization is a persistent problem (ibid). The aim of this chapter is to discuss the phenomenon of overutilization of imaging tests with respect to healthcare fairness. Before entering the discussion of fairness, we will briefly outline the concept of overutilization, and the scope and drivers of the phenomenon. We will end the chapter by indicating some potential solutions to combat overutilization of imaging tests.

8.2. Defining Overutilization

Overutilization is but one of many concepts used to describe excessive or “too much” imaging (Hofmann 2010). While other concepts that address the issue of excess highlight various issues, such as usefulness (“non-productive”), need (“unnecessary”), safety (“overexposure”), morals (“inappropriate”), and lack of control (“indiscriminate use”), overutilization address both amount and utility (Otero et al. 2006). Lack of utility is a central feature of overutilization, which includes aspects of usefulness and need. In the medical context overutilization are understood as examinations not useful or not needed in the sense that they are deemed unlikely to contribute clinically to the patient’s treatment (Blachar et al. 2006). A related term is *low-value care*, which refers to an “intervention in which evidence suggests it confers no or very little benefit for the patients, or risk of harm exceeds probable benefit, or more broadly, the added costs of the intervention do not provide proportional added benefits” (Elshaug et al. 2017). Terms like *inappropriate* or *not indicated* imaging are frequently used, reflecting that the main concern embedded in overutilization is the missing/marginal benefits or clinical value of the examination.

Overutilization is also increasingly being addressed in the radiation protection context, where it is related to the concept (and principle) of *justification*. The principle of justification states that application of a particular procedure to an individual patient should be judged to do more good than harm (Clement and Ogino 2018). In the radiation protection context overutilization is first and foremost a safety issue where harms in focus are the radiation detriment that the examinations may cause. However, the justification principle require consideration of benefits, costs and negative consequences to the individual

patient as well as society (Clement and Ogino 2018). Hence, the radiation protection perspective also includes a utility issue, in terms of waste of healthcare costs and resources in society. Overutilization understood as an issue of waste and futility is a most relevant perspective when addressing the fairness below.

In this chapter we will limit the understanding of overutilization to entire tests/examinations, requested and performed. It can be argued that too many projections and retakes can be classified as overutilization. However, to also address overutilization caused by how examinations are carried out is a question of optimization of procedures and beyond the scope here, as the question of justice mainly concerns providing and receiving imaging services or not.

Irrespective of what we emphasize in our understanding of overutilization it should be noticed that a single examination can be classified as overutilization only in retrospect, when the outcome is known. Besides, the outcome can be hard to determine because of the time spend as well as the various actions and incidents between the examination and the final health outcome. These facts of uncertainty make overutilization a highly complex phenomenon to define, determine, measure, and assess.

8.3. Mapping Overutilization

Investigating overutilization rates are by no means straightforward, reflecting the lack of clear distinctions between medically appropriate and inappropriate examinations. Still the number of empirical studies of unwarranted radiological examination are continuously growing, aiming to determining the extent of inappropriate radiological examination.

These studies use a variety of methods. A rough idea of the potential extension of overutilization based on referral quality can be obtained by asking radiographers and radiologists to state the proportion of examinations they approve out of those they are requested to justify (Koutalonis and Horrocks 2012). Most studies on the extension of overutilization are based on assessments of the referrals compliance with guidelines/imaging pathways. For instance a Finnish study found only 24% of the cervical, 46% of the thoracic, and 32% of the lumbar spine radiography referrals were in compliance with guidelines before the interventions (Tahvonen et al. 2017) and an Australian study found 40% of emergency department x-ray examination was deemed unnecessary not meeting an imaging pathway (Rawle and Pighills 2018). The underlying moral values in such approaches to measuring overutilization is conformity to professional norms and standards. Two other approaches investigate whether the examination solves

the referrer's clinical problem (Simpson and Hartrick 2007) or whether the examination affects the subsequent management of the patients (Lehnert and Bree 2010). The moral value embedded in these approaches is normally the utility for the referring physicians or efficient health care, in terms of economic impact (Adams et al. 2018), i.e. a society perspective of usefulness and waste. However, few studies investigate the outcome of overutilization on patient health.

The investigation of overuse may also differ with respect to scope, focusing on a single modality or specific examination, for example: CT examinations (Almén et al. 2009) and spine radiography (Tahvonen et al. 2017). Moreover, the studies may only investigate referrals from limited practice settings, e.g. primary care or emergency department. These and other variations in research methods make it difficult to determine and accurately compare rates of overutilization of examinations across institutions and geographical areas. Keeping these scientific uncertainties in mind, overall overutilization is roughly estimated to be about ¼ of all radiological examination in developed countries.

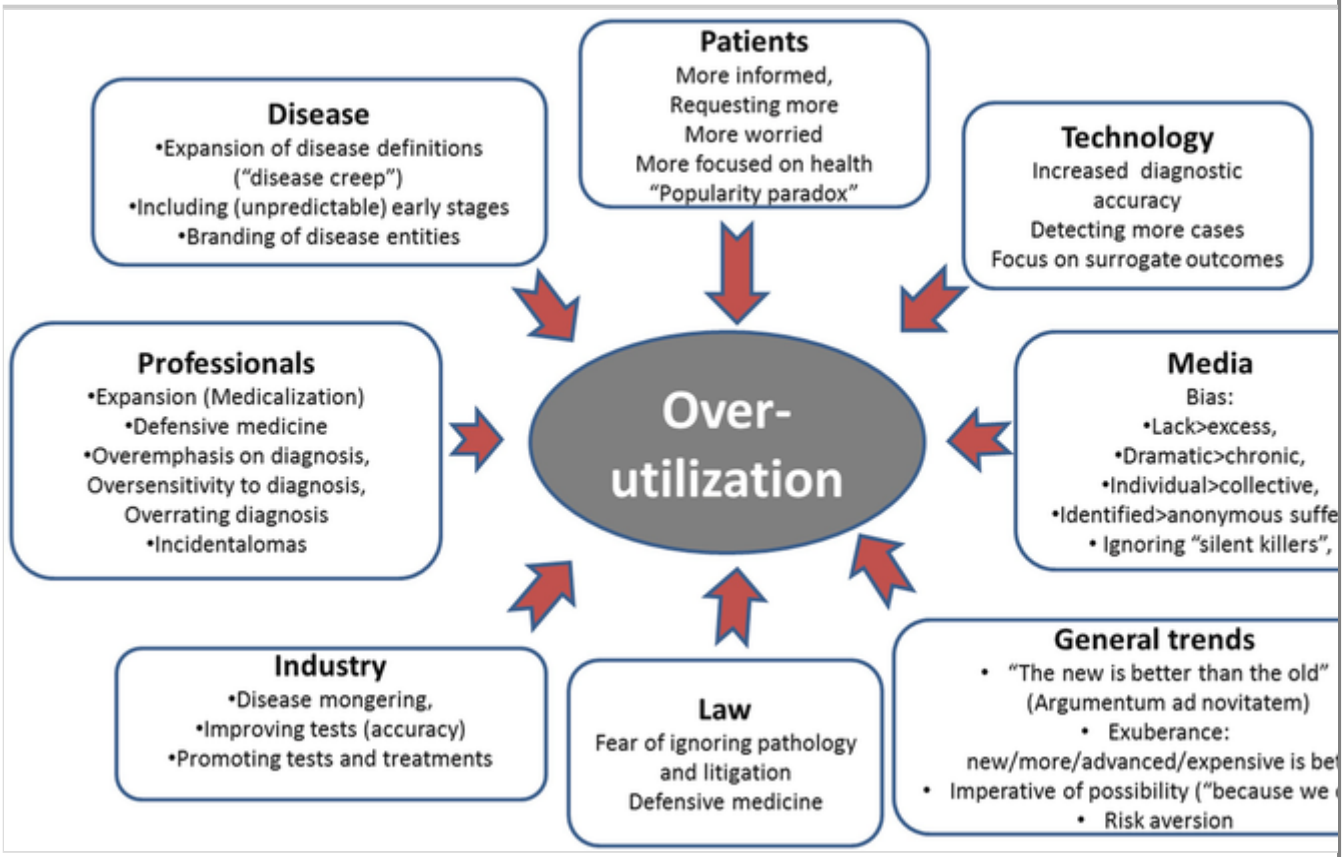
8.4. Drivers of Overutilization

We started this chapter with mentioning one of the main drivers of overutilization of imaging, i.e. the fascination of the amazing technology and its apparent infallibility. This means that characteristics of the technology itself and how it is apprehended by us can lead to overutilization. The appeal of high-tech imaging can be explained by our intuitive beliefs, which tells us that "[m]ore is better, new is better, more expensive is better, and technology is good (Saini et al. 2017) or that "earlier is always better than late" (Hofmann and Skolbekken 2017). Hence we will opt for one examination too many rather than one too few.

These beliefs are examples of drivers of over- and underuse of health-care resources in general that also apply to overutilization of imaging. They belong to the first of three identified domains: (a) knowledge, bias, and uncertainty; (b) money and finance; and (c) power and human relationships (Saini et al. 2017). Just to give a few examples with domain (b) fee-for-service or volume-based payments encourage the provision, and poor coordination of services delivered to individual patient can lead to duplication of services. Regarding domain (c) imbalance of power and lack of trust in the patient-clinician relationship can cause overutilization as well as underuse (ibid). Figure 8.1 gives an overview of some of the drivers of overutilization.

Fig. 8.1

Overview of some of the drivers of overutilization, based on Hofmann 2014



We will not go into further details here. The main point is that drivers of overutilization make up a highly complex picture, as all domains operate at the global, national, regional, and individual level and a multiplicity of single factor are interacting. A number of stakeholders are ascribed responsibility: patients, next of kin, clinicians, administrators, payers and health policy makers. In imaging, radiologists and radiographers add up the number of stakeholders, and increases the complexity. We will return to a discussion of their role in the final section. The point here is that to address and reduce overutilization we need to identify its drivers and stakeholders.

8.5. Overutilization and Fairness

Overutilization of diagnostic imaging is intuitively incompatible with fairness. In order to better understand this intuition, we will in the following outline three theoretical perspectives of fairness: the egalitarian, the utilitarian, and the contractarian, and illuminate why overutilization is inconsistent with them all. According to Rawls fairness and justice are different (because fairness is the fundamental idea of the concept of justice). However, for the topic of this paper we do not need to distinguish between fairness and justice.

8.6. The Egalitarian Perspective

Fair allocation of benefits between people can be based on the principle of *need*, *merit* or *equality*. In the context of health care allocating benefits according to persons' *needs* is obviously accepted, while *merit* is more controversial. The principle of *equality* is important in just health policy, as displayed in the Nordic countries through equal and universal access to services and (mainly) tax based financing (Vrangbæk et al. 2009). Theoretically, justice requires equality by default if: (a) there are not any relevant distinguishing feature between people that legitimate unequal distribution of advantages and disadvantages or (b) we do not have reliable ways of identifying and measuring the unequal claims people may have (Miller 2017). Certainly, peoples' health conditions lead to legitimate unequal claims for health care services, which is reflected in priority setting criteria like disease severity (associated with medical need) and effects of the treatment (Mobinizadeh et al. 2016). This is not the issue here, as overutilization point towards a low score on priority setting criteria.

We know that radiological services are not distributed equally between groups of people. People living in urban areas with easy access to radiology services are likely to receive more services (Lysdahl and Borretzen 2007; Nixon et al. 2014), whereas e.g. people living in nursing homes are likely to receive less radiology services compared to the general population (Kjelle et al. 2019). Furthermore, the utilization of diagnostic imaging services varies with age, gender, and socioeconomic status (Wang et al. 2008). As these features cause unequal distributions that cannot be explained by differences in medical need, the variation can be judge as unfair, representing a challenge to the principle of equality.

Variation in use is largely associated with overutilization, even if underuse may occur like in the case of nursing home residents receiving less radiological services than the general public despite their higher needs (Kjelle et al. 2019). When overutilization of radiological services is considered to be a bad thing, it is mainly because it results in unnecessary risks from exposure to ionizing radiation and contrast media, false positive results, incidentalomas[1] and overdiagnosis, which in turn can lead to follow up investigations, unnecessary side effects, and (over)treatment. The final outcome may be inflicted harm to the patient in shape of physical and/or metal suffering.

Certainly, people may gain from examinations that were not considered justified in the first place. For now, we limit the good in question to (improved) health outcome. The main advantages used as arguments for a "permissive" practice is the value of detecting diseases at an early (pre-symptomatic) stage. Certainly, true positive findings can be detected incidentally and render possible early access to treatment. One problem with this argument is delimitation: what should

be regarded suitable intervals of testing “just in case” of early stage asymptomatic decease? The other unfairness embedded in this argument is that some people will gain from overutilization at the expense of the many who will suffer from increased risks and other disadvantages. Those not receiving too many radiological are most likely better off being spared from the health risks of overutilization. Moreover, there is a strong and partly unwarranted belief in early detection (Hofmann and Skolbekken 2017), that may result in more harm than benefits, i.e. incidental findings of uncertain or low significance, overdiagnosis and overtreatment as mention above.

8.7. The Utilitarian Perspective

Utilitarianism is said to “accommodate and explain much of what we intuitively believe about justice” (Miller 2017) as it is about maximizing the good (Hooker 2016). In this perspective an action is right if it is expected to generate utility, i.e. a higher or equal amount of overall net benefit than other relevant alternatives – all involved parties considered. Still the intuitive understanding can be hard to defend as one of the main objections to utilitarianism, is precisely that it “gives no direct weight to considerations of justice or fairness in the distribution of goods” (Scheffler 1987). Hence, a utilitarian argument for fairness must rest on that fairness will contribute to utility. Preference utilitarianism uses satisfaction of desires as a proxy for utility, and from this point of view it could be argued that providing imaging services in accordance with peoples’ desires would justify overutilization. If receiving an examination is considered an intrinsic good, i.e. the value of knowing that you have been investigated with the very best technology, overutilization can be defended. Respecting patients’ right to decide does however presuppose that their preferred choices are well informed and sustainable, which may not be the case regarding consequences of too many radiological examinations. It is also commonly claimed that providing imaging services beyond what is strictly medically needed is useful because of its reassuring effect. Utility should be achieved because people feel comforted by an examination “just in case” to confirm their health. However, empirical test of the claim shows that diagnostic tests hardly make any contribution to reassure peoples with various health complaints (van Ravesteijn et al. 2012). Besides, irrelevant radiologic [e.g. degenerative] findings might lead to uncertainty in both GP and patient (Espeland and Baerheim 2003), and reduced well-being. Even if it we could prove the utility of providing services based on the strength of preferences, this can be considered unfair as our expectations are sensitive to whether or not we are used to getting our preferences satisfied (Gandjour and Lauterbach 2003).

Perhaps the most important utilitarian argument against overutilization is the relatively high opportunity costs when material resources (equipment) and personnel are preoccupied with useless (or futile) care. Opportunity costs is the value of the next best choice of utilizing the radiological resources. Within the services, overutilization of imaging can cause queues of patients and displace examinations that would have been more useful (Nuti and Vainieri 2012). "Freeing the resources from low-value care creates new opportunity for redressing underuse within the same budget envelope" (Elshaug et al. 2017). In society at large, the futility and waste associated with overutilization, clearly indicates that higher utility could have been achieved by allocating the resources to other good causes.

From a rule utilitarian perspective justice and fairness are considered rules that when followed will promote overall welfare and happiness. As overutilization of imaging is incompatible with fairness it should be combated from a rule utilitarian point of view.

8.8. The Contractarian Perspective

Contractarianism offers an "understanding of justice by asking the question; what principles to govern institutions, practices and personal behaviour would people choose to adopt if they had to agree on them in advance" (Miller 2017). Such a hypothetical contract based on agreement should ensure that principle chosen would not lead to unacceptable outcomes. In contractarianism the difference principle in Rawls theory of justice states that inequalities should be arranged to the greatest benefit to those least advantaged (ibid). This concerns social and economic inequalities, but here we take the liberty of a broader approach including inequalities in health condition and wellbeing.

Accordingly, the question is who are exposed to overutilization? Some indications are given in the literature about access and drives to services. Patient demands are regarded a major driver of unnecessary imaging (Hendee et al. 2010) (Fig. 8.1), which point to the worried well. However, a vulnerable group of people with high demands are those with chronic muscle and skeletal complaints. For these a referral to imaging services can serve illness legitimisation and the GP have little else to offer (Espeland and Baerheim 2003). Socioeconomic status of patients have been studied and found not to influence the use of scintigraphy, but gender and age do to some extent (Miron et al. 2014). A more direct answer to who receives too much imaging is given in a recent systematic review (Tung et al. 2018). The authors included 20 studies and found that overutilized imaging in emergency departments were greater in older patients, those with higher Injury Severity Scores and those having more comorbid diseases. This means that both

people well off and those not so well off are exposed to overutilization. The important point is however that overutilization seems to add to the burden of those least advantaged.

8.9. Potential Solutions

The problem of overutilization of health care services is vast and complex, which require “levers targeted from the patient level to the government policy making level” (Elshaug et al. 2017). Within the field of medical imaging a number of strategies have be suggested to reduce overutilization (Hendee et al. 2010). The traditional approaches include educational strategies towards physicians, patients and the general public (Oren et al. 2019). Educational strategies can focus on understanding the risks associated with exposing patients to various radiation doses, like the Awareness component in the Triple A approach from the radiation protection bodies (International Agency of Atomic Radiation 2015). Increased awareness about radiation and risks among physicians and patients is assumed to reduce the pressure for redundant examinations (Picano 2004). This strategy seems to be demanding as a number of studies confirm that physicians understanding of radiation dose, safety, and potential hazardous effects from imaging remains generally low (Hollingsworth et al. 2019). A strategy focusing on lack of usefulness and risk of harm from incidental and false findings may have higher success, because of the close link to the immediate (expected) outcome of the examination and because these risks are generally easier to grasp. Besides, one could question whether it is fair to kindle peoples’ fear of radiation, particularly if the radiation risk is a substitute argument for concerns about wasted resources and costs.

The second main strategy is the implementation of appropriateness criteria (Oren et al. 2019), and referral guidelines are developed that can be integrated into electronic referrals or used as a stand-alone web portal (European Society of Radiology 2018). However, it is challenging to make people aware of guidelines in the first place and then to adhere to them (Gransjoen et al. 2018, Tack et al. 2018). It is recognized that the referral decisions can be challenging for the referring physicians, and that they need more support from members of the Department of Radiology (Kruse et al. 2016).

The role of the radiologist in curbing diagnostic waste can be limited to serve as consultant for the referring physician (Otero et al. 2006). A more active approach is to assign radiologists responsibilities for vetting, screening, preauthorizing referrals (Picano et al. 2007). One reason why this approach is not fully utilized (O’Reilly et al. 2009) is the insufficient grounds of the critical assessment, i.e.

the lack of clinical information and unclear clinical questions in the referral (Lysdahl et al. 2010).

An alternative approach would be to allow more discretionary power to the radiologist, as argued by Durand et al. (2015): “In the era of value-based care, radiologists must expand beyond their traditional roles as imaging interpreters to become managers of the entire imaging value chain. Ensuring imaging appropriateness is an essential part of that process.” One could ask why the referral system require a specific test to be requested, instead of enabling the radiologist to recommend the most appropriate diagnostic test in the clinical situation (Kenny and Pacey 2005). Radiographers can also contribute to justified examinations by evaluating the amount and quality of information in the referrals (Vom and Williams 2017), by providing supplementary information (Hannah and McConnell 2009), and by authorizing referrals according to guidelines (Matthews and Brennan 2008). The advantage of increasing the engagement of radiologist and radiographer to combat overutilization is first and foremost that they are in a better position of keeping up-dated about appropriate procedures. They may also be less responsive to patient demands. Finally, it can be argued that is fair to allow them more influence as they are ultimately responsible for the services they provide, and excessive utilization and unnecessary examinations represents a practical and moral challenge in their daily work (Gottlieb 2005; Lewis 2002; Wilner 2007).

More attention should also be paid to biases, inclinations, and imperatives in handling technology. A wide range of irrational (psychological and emotional) mechanisms have been identified in assessing and implementing technologies (Hofmann 2019). Paying attention to such mechanisms is crucial when addressing overutilization of imaging. In addition to strategies towards the professionals, more attention should be paid to organizational aspects like, ownership of equipment (Hong et al. 2017) and payment scheme (Iversen and Mokienko 2016). Fortunately, the international Choosing Wisely campaign (Levinson et al. 2015) together with other measures to reduce overuse have shown that it is possible to address overutilization of radiological services.

8.10. Conclusion

We have tried to show that overutilization may be difficult to define and measure, and that it has a wide range of drivers. Overutilization is morally problematic, and incompatible with fairness across three conceptions of the term: because of the arbitrary distribution of benefits and risk between people with equal medical needs (egalitarian perspective), the distribution of services that will not maximise utility (utilitarian perspective), and overutilization does not

benefit those least advantaged (contractarian). While there is a wide range of suggested measures to halt or reduce overutilization, there are no easy solutions to a serious problem to modern health care. Strategies are needed at political, organisational and professional level, where interdisciplinary efforts are needed.

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[1] An incidental imaging finding is defined as “an imaging abnormality in a healthy, asymptomatic patient or an imaging abnormality in a symptomatic patient, where the abnormality was not apparently related to the patient’s symptoms.” (O’Sullivan et al. 2018)