THE CASE STUDY IN MEDICINE

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Introduction

The case report continues to be exceedingly popular within medicine. A survey in the early 2000s documented publication of approximately 40,000 new case reports per year, representing 13.5% of all publications in core medical journals (Rosselli and Otero 2002). With the recent founding of several peer-reviewed, open-access journals dedicated to cases (Kidd and Hubbard 2007) and improvements in the communication and dissemination of cases via internet-based databases, rapid and easy exchange of information via cases has increased significantly. Hence, although the preferred venues may have changed for this genre of publication, it is indisputable that cases remain an important form of medical literature.

In short, a case report describes a medical problem experienced by one or more patients, usually involving the presentation of an illness or similar that is puzzling or otherwise difficult to explain or categorize based on existing understandings of disease or understandings of physiology and pathology. Typical cases outline the presentation of the disease, diagnosis, treatment, and outcomes of the patient, with a focus on practice-based observations and clinical care (rather than the results of randomized controlled trials [RCTs] or other experimental methodologies). Although cases are not equivalent to narratives, many researchers have commented on their highly standardized narrative structure (Hunter 1991; Hurwitz 2006). The goal is to capture information about particular cases, including many details that may not be immediately relevant, but that could prove to be, so that the information contained in the case and the case itself can be useful over the long term and so it can be systematically combined with other cases into larger data sets.

The published case report can be used for a variety of purposes (see Gagnier et al. 2013): for instance, it can be utilized in clinical settings should other instances of a similar condition or disease arise, or it may serve as the basis for clinical research based on the hypotheses suggested in the account of the case. In addition, cases often prove pedagogically useful, particularly when they recount the processes through which clinicians came to a better understanding of the patient’s condition, prognosis, or outcomes, even where negative outcomes resulted. Cases can assist with identification of adverse reactions to drugs or other stimuli, documentation of beneficial effects of certain therapies particularly in new contexts, or recognition of novel or emerging diseases as well as unusual presentations of recognized diseases. An oft-cited example of the success of case reporting is the recognition of the relationship between use of the drug thalidomide by pregnant women and severe limb and other deformities in newborns (even though the underlying causal mechanism only came to be understood over time). In this
chapter, I use the term “case” to refer collectively to published case reports as well as case series (examining multiple patients with similar symptoms or conditions) presented as a published report, as these are the most easily accessible forms of cases and are not dissimilar from those typically presented in pedagogical contexts (as will be discussed later).

One of the most famous examples of a case was a series of five cases published in June 1981, which presented information about young homosexual men with a specific form of pneumonia, viral infections, and severe oral thrush, two of whom had died (CDC 1981a). Once a second report appeared in early July detailing a spike in cases of Kaposi sarcoma (an aggressive, cancerous tumor caused by infection with a form of herpes virus) and pneumonia among homosexual men (CDC 1981b) and the popular media began its coverage (Kinsella 1989: 115), the public as well as the medical community began to take notice. By December 1981, there was enough evidence to warrant publication of several articles related to this disease condition (which had yet to be named, but came to be called acquired immune deficiency syndrome or AIDS), which appeared as research articles but the content of which still was largely case-based (Gottlieb et al. 1981; Masur et al. 1981; Siegal et al. 1981). I will return to this example throughout the paper to illustrate various features of cases and the types of reasoning done using them in the field of medicine.

What are some of the common characteristics for what makes a case? The overwhelming majority depict complaints arising in specialty or subspecialty settings (with some differences in format and style across subspecialties, which I do not discuss in this chapter), often where diagnosis would be difficult or particularly tricky, and describe uncommon or even “unique” clinical occurrences (McCarthy and Reilly 2000) observed under uncontrolled conditions (Simpson and Griggs 1985). In its instructions to authors, The Lancet stresses that it aims to publish those cases that have a “striking message” (Bignall and Horton 1995). Many report rare conditions for which trials of various types of therapies (particularly RCTs) are not feasible due to low patient numbers or ethical issues (Albrecht et al. 2005).

Single cases are seen by some as problematic as a form of evidence, inasmuch as they capture exceptions or highly unusual manifestations of illness and disease, rather than typical ones that might support generalizable rules. Because of this, they remind practitioners and others that the field of medicine is in fact a “science of particulars: (Gorovitz and MacIntyre 1976), or even as often claimed, an art rather than a science. They highlight the importance of clinicians having diagnostic “puzzle-solving skills” and not only scientific knowledge, a fact that has been well recognized in popular culture through Oliver Sacks’s books and more recently in the television series House, MD. Although publication of case reports has a long history in prominent journals, systematic guidelines for case reports have only recently been developed through the articulation of a consensus-driven international framework for case reporting that the guidelines’ authors argue will promote more consistency, transparency, completeness, and impact (Gagnier et al. 2013).

How Do Practitioners Use Cases as a Form of Knowledge?

Use of cases involves complex processes of pattern recognition among other epistemic and practical skills. Suppose a patient presents to a physician with several symptoms that are individually identifiable. Perhaps these symptoms have not previously been seen in this combination and have not been recognized as together constituting a discrete disease condition (or an adverse reaction). Often a particular cluster of symptoms does not “make sense” for the patient in question, for instance due to her baseline health condition or personal history. In this type of case, the pattern being sought is a diagnostic category describing a syndrome or disease (or details of an adverse reaction), which can be used to make decisions about the
provision of therapies and prognoses. Otherwise, if no pattern is detectable, the symptoms may need to be treated individually, or else multiple diagnoses will need to be made and treated as appropriate.

Practitioners then can engage in a process of gathering additional information using a variety of mechanisms such as case reporting or comparison to other cases in the published literature. By organizing (and reorganizing) the various details about a particular patient, they can propose a diagnosis that establishes which facts are relevant and how they are interrelated. Published cases thus allow practitioners to recognize similar patterns as new patients present themselves, to make decisions about the most appropriate clinical care, and to expand their background knowledge beyond their experiences of the typical or the usual in the clinic.

To return to the example of what came to be known as AIDS, the disease was first noted in late 1979 by clinicians in California who saw a number of young, homosexual men presenting with symptoms of a mononucleosis-like syndrome, including fever, weight loss, and swollen lymph nodes, as well as thrush and diarrhea, which are not symptoms of mononucleosis (Grmek 1990; see also Shilts 1987; for a longer discussion of this example, see Ankeny 2011). Meanwhile in New York City, Kaposi sarcoma was observed in a number of young, homosexual men with friends in common; this cancer had previously only been seen in elderly men of Mediterranean descent. Thus, the mismatch between the observed symptoms and the patients’ background conditions triggered increased scrutiny about what the shared patterns in the patients might be. The original published case proved useful because its epistemological structure reflected selectivity about what information was included and emphasis on particular facts about the patients, which signaled its authors’ suspicions about the nature and mode of transmission of the disease: for instance, although the total number of patients described was relatively small (five), the authors clearly thought it could be no coincidence that these were homosexual men who were sexually active, which in turn pointed to the hypothesis that the underlying disease condition was likely to be infectious in nature. Hence, in this example, it is clear that the information contained in the case is not disputed; in other words, the truth status of the various claims is not in question, but more importantly their relevance and whether they are essential (or just incidental) correlations becomes a key matter for debate and clarification.

Ongoing documentation of what amounted to nearly 200 patients, apparently based in only three geographic locations (New York City, Los Angeles, and San Francisco) (Grmek 1990: 11), solidified theories about the disease’s mode of transmission (and that in fact it was a distinct and new disease condition).

By 1982, the literature on what came to be known as AIDS began to grow, and within about one year, cases with similar symptoms emerged in different populations, including Haitian migrants, blood transfusion recipients with and without known risk factors, and women, which helped to further refine what philosophers would term the necessary and sufficient conditions for the diagnostic category. These new examples triggered re-evaluation of the relationships and assumptions about the existing facts associated with the case, particularly the association of the disease solely with homosexual men.

This case also allows us to understand that much of the information contained in cases may well prove irrelevant or even misleading: as mentioned above, the opening paragraph of the published case noted that all of the patients also were infected with a particular virus (cytomegalovirus or CMV). As one of the authors, the immunologist Michael Gottlieb, later wrote, “we rushed to judgment, overlooking the fact that CMV is a common opportunistic infection in immune compromised organ transplant recipients” (1998: 367), and hence likely to be common in any immunocompromised group. This example underscores the potential fruitfulness of even those cases that contain information that later proves to be irrelevant (or even incorrect), so long as the balance of the information within a case proves to be relevant.
Misleading information can be identified and weeded out with the addition of more data or information, which can reveal mere correlations or coincidences (as in the case of CMV infection, which proved not to be directly relevant to the etiology of AIDS) or that a particular attribute does not apply beyond the small population described in the case at hand and hence is inessential to it. In a similar way, the fact that many who had the disease were homosexuals was later determined to be relevant but not essential, which in part lead to the abandoning of one of the original names for the disease, GRID (gay-related immunodeficiency disease).

How Are Cases Utilized in Medical Education?

It is claimed that a good case study “begets awareness, jogs the memory and aids understanding” (Morgan 1985: 353), a description that indicates the mixture of educative and epistemological goals inherent in cases. For generations, medical training depended on cases, arguably back to ancient times and the Hippocratic corpus, which was highly narrative and contained considerable material that resembles contemporary published cases (for more on the Hippocratic corpus and other relevant historical examples, see Hurwitz 2006). As the physician-philosopher Howard Brody puts it, “without a storehouse of case exemplars to draw upon medicine could be neither taught nor practiced” (2003: 9).

Medical education also can produce cases: for instance, the generation of the AIDS case discussed above in fact occurred in a teaching setting. When Gottlieb asked one of his immunology fellows to look for interesting teaching cases, he was told about a young homosexual man with what seemed to be a severely damaged immune system (Fee and Brown 2006); this man then became the index patient (the first case of a condition to be described in the medical literature, otherwise known as patient zero) for the original case report.

As used in medical training, the case comes to have a sort of “generic” existence as it is used as a way of thinking through differential diagnoses (Montgomery 1992; Ankeny 2011); no longer is the published case about an individual patient, but instead it becomes the prototype of a particular disease or condition. However, the use of cases in medical education also is rather paradoxical, given that published cases often recount unusual, rare, or even unique instances; at worst, cases might be considered to have the status of anecdotes (Hunter 1986), particularly as compared to evidence generated by RCTs, systematic reviews, and so on.

However, cases continue to be used and to have considerable value in medical pedagogy, in part because of their standardized and highly stylized formats, which provide a way of organizing the type of detailed information typically present in clinical settings. When used comparatively, cases can allow the tracing of evolving practices and theories of disease over time, including changes in what factors are given the most weight in the clinical encounter and in turn changes in the doctor-patient relationship (Monroe, Holleman, and Holleman 1992; Hurwitz 2006). In addition, cases (as accounts of single instances) can serve as reminders to pay attention to the details of any particular patient, and that in some cases, such patients will be exceptions to the “rules” that dominate much of medical training and practice (Hunter 1996). As Kathryn Montgomery Hunter notes (1996), the oft-heard clinical maxim “When you hear hoof beats, don’t think zebras” underscores that despite uncertainties inherent in clinical care, many cases are in fact typical, and thus there is a need to cultivate both scientific and practical knowledge through medical training. Cases are a fundamental means of capturing these trade-offs, inasmuch as they model the dissection of the complexities of real-life instances of illness or other clinical conditions and sorting through what is relevant and essential and what is incidental or mere correlation.

So to return to the case of AIDS, a certain process was followed that reflects the logical elimination strategies that guide much of clinical care. First, the clinician ruled out the
known causes of this sort of immunosuppressed condition, including chemotherapy for cancer, immune-suppressing drugs used post-transplantation, and an inborn autoimmune disorder (Gottlieb 1998), none of which applied to the patient in question. Candidiasis (the particular form of thrush in evidence) was known to be typically associated with a deficiency in T-lymphocytes, and thus blood tests were done that revealed a marked decline in the number and function of this type of lymphocyte. A case report discussion among the teaching hospital’s immunology postdoctoral fellows and internal medicine residents then resulted in a decision to use an experimental technique to identify subclasses of lymphocytes, which led to the identification of a severe depletion of CD4+ helper cells, which initially could not be explained. Only after the patient was discharged without a diagnosis, then readmitted a week later with a rare form of pneumonia usually only found in immunocompromised patients, and additional patients who also were homosexual men were referred with the same symptoms, the same form of pneumonia, CMV infection, and similar blood results, did the medical team narrow in on the new disease condition and its key characteristics, which became known as AIDS.

Many commentators have noted not only the benefits but the limitations of using cases in medical education, perhaps most pointedly Rita Charon: “The genre, in the end, is the distillation of many medical lessons, and by teaching our students how to tell this type of story, we teach them deep lessons about the realms of living that are included and excluded from patient care” (1986: 10). In other words, although cases do allow patients’ stories to be told, in their contemporary form they also are highly abridged, standardized, and formalized, and thus typically lack the voice and point of view of the patient. This silence has not always been the case if we compare the conversational style of cases in the 17th and 18th centuries (Hurwitz 2006). Some journals now actively promote the inclusion of patient perspectives in case reporting, although the uptake of this approach remains somewhat limited (Ankeny forthcoming).

What Kind of Evidence Do Cases Provide?

As noted previously, cases have sometimes been viewed pejoratively as too speculative and lacking in any real evidence, particularly because they often provide information about singular instances (i.e., they are n’s of 1) without any controls or underlying experimental methods, hence raising questions about their validity and generalizability. This criticism has become heightened in the current era, which is dominated by evidence-based medicine (EBM) and which places RCTs at the top of its hierarchy of evidence. Cases are typically and essentially observational, and the circumstances under which the observations and even the documentation of the observations are performed are uncontrolled as they occur within real-life clinical settings. Some might even claim that the narrative form common to many cases in fact obscures what should be taken to count as evidence, as the information contained in cases is not filtered or prioritized; this claim taken to an extreme is, of course, debatable as the example of the processes associated with the formulation of the AIDS diagnosis recounted above reveals.

However, it is important to note that even standard accounts of EBM include as a type of evidence a form of research that aggregates individual cases known as the case series, where patients with similar attributes (e.g., who received the same treatment or who were exposed to the same chemical or other toxic substances) are tracked over time using descriptive data and without utilizing particular hypotheses to look for evidence of cause and effect. Admittedly, EBM places the case series rather low in its hierarchy of evidence but nonetheless acknowledges its potential usefulness in instances where forms of evidence that rate more highly are not available, as may often be the case where human patients are concerned due to practical or ethical reasons, or where the available evidence at higher levels has been produced in a manner that is methodologically flawed.
In the simplest sense, even singular cases clearly can be used as hypotheses to refute existing generalizations, at least if we accept a simplistic form of confirmation theory. So, for instance, once AIDS was described and came to be understood as caused by HIV infection, it was initially thought that HIV was universally fatal. However, with the development of a range of highly successful treatments for HIV, people with it who are treated are living much longer than those who are not treated and sometimes do not develop AIDS, a phenomenon that was recognized in part out of individual cases. However, this type of use of cases as a form of evidence is fairly limited in medicine, which rarely relies on simple generalizations such as the one described here.

A more common use of published cases to provide evidence is associated with the considerable detail often contained in them, which allow them to serve as springboards for future investigations. Cases can be reused as evidence of something other than that which they were intended to show or be reanalyzed with attention to different details than in their initial usage, particularly because of the rich information that they typically contain. In the case of AIDS, we can see that cases often include information without making the logic of the inclusion of particular claims explicit, but which opens up avenues for additional reporting and research. Thus, the closing paragraph of the published case listed a series of facts without additional comment, for instance, that the patients did not know each other and had no known common contacts, that they were not aware of sexual partners with similar illnesses, and that all five patients reported using nitrite inhalant drugs (“poppers”). It is likely that this information was included to hint at possible hypotheses about the etiology of the disease (namely, that the disease likely was infectious and transmissible through blood and/or sexual contact) but for which not enough evidence (in conventional terms) was available. The specific mention of lack of known common contacts or of ill sexual partners points toward what would later emerge when tracing the disease’s epidemiology, namely that transmission was occurring in part through movement of individuals with numerous and often casual sexual partners and that the disease was not affecting all people who were carrying HIV in a similar manner, conclusions that were drawn from this case in retrospect once it was reanalyzed in light of additional epidemiological and other information.

Can Cases Help Us to Identify Causes?

Although cases often are considered to be highly limited in terms of their abilities to allow causes of disease and illness or other clinical phenomena to be identified, whether this claim is in fact valid depends on what account of causality is utilized. If we take the search for causes to be a matter of identifying both necessary and sufficient conditions, individual published cases typically will fail the test, as they are not documented under controlled conditions that would allow sufficient conditions to be detailed. An alternative account might utilize a causal network model, which would be highly compatible with the narrative form taken by most published cases as well as with clinicians’ actual practices of working through the details of a disease condition and its potential causes, particularly in discussions with patients, as Paul Thagard (2000) has noted. As detailed in the initial reporting of the immunocompromised patient seen by Gottlieb and his team, a detailed narrative was developed that outlined various putative causes and systematically excluded certain ones as irrelevant based on additional information from the patient’s medical history, bloodwork results, and so on. Even the content and format of the case supports this type of view: as more information is gathered, certain hypotheses are narratively “tested” against what appear to be putative necessary and/or sufficient causal conditions. The processes of ruling in (and out) various possible causal factors also reflect aspects of clinical practice relating to what often yet misleadingly is termed the “art”
of the case. Although reasoning via cases does involve particular skills that may be difficult to axiomatize and teach, experienced practitioners also engage in a detailed, systematic sorting and weighing process of various factors in ways that are highly specific, and derive from both medical education and training, especially in differential diagnosis (Hunter 1991), as well as the long history associated with the particular format, language, and contents in which cases appear in the published literature. And given that clinical practice is about actually caring for patients and not just coming up with generalizations and laws, as might be the case in a purely theoretical science, such processes are an essential part of medicine.

Cases and their analyses also can be viewed as preliminary steps in a longer process of medical research by providing working hypotheses about causal attribution that can ground further tests of causal relations (for additional examples relating to a series of cases associated with ingestion of high-dose caffeine, see Ankeny 2014). Individual cases can play this sort of role, but these attributions are most common when cases are brought together and compared, which allows similarities and differences to be articulated and new information to be added, until a clear hypothesis about causality can be identified and tested. Hence, the attribution of a putative cause in clinical settings via cases can provide information that allows medical researchers to engage in more “conventional” or traditional methodologies such as RCTs, cohort studies, and so on to explore various causal hypotheses. Without the information provided via cases, the range of potential causal hypotheses would be much less narrow, and thus not allow as specific a focus on key likely causal pathways.

However, with regard to clinical care, cases tend to play a much narrower role: they assist practitioners to identify a cause that can be manipulated to cure (or prevent) the condition in question, in order to treat patients who might present with similar patterns of symptoms until better evidence can be produced (if ever). This approach to causation is known as a manipulability approach, and it has been defended most forcefully in the context of medicine by Carolyn Whitbeck, who notes that clinicians focus on the (causally related) sufficient conditions for cure and “speak of it as ‘the’ factor which cured the disease” (1977: 628). This attribution is similar where prevention is the main goal: practitioners focus on the (causally related) necessary conditions, avoidance of which would have prevented the development of the disease condition. A manipulability approach is highly instrumental and as such is greatly dependent on the current state of medical knowledge, as well as on the particular details available in relation to any one patient or case.

Thus, as argued elsewhere (Ankeny 2014), the approach to causality that appears to be embedded in case studies due to their narrative structures, the context within which they are written and disseminated, and the type of evidence typically presented in them relies on manipulability. The key idea of such an approach is that causal relations are best analyzed in terms of the production or prevention of some state of affair by manipulation of another (see also Collingwood 1940, Gasking 1955, and for a more technical examination, Woodward 2003). Given that cases are aimed in large part at documenting instances of clinical practice, and assisting with future patients who might present with similar conditions, what is key in the determination of causes is what can be manipulated in practice (based on current knowledge and technologies), and not in principle, which in turn also guides the hypotheses that are likely to emerge for testing within a research context.

Conclusion

In summary, although cases are perennially criticized for their lack of rigor and consistency, and as low-standard substitutes written by those who are not able to publish “real” medical research, this chapter has attempted to explain why cases continue to retain their critical place...
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within the medical literature as an important means of communication among practitioners, as well as for promoting improved clinical practice and for educating health care professionals. Further philosophical research is warranted into the use of cases within diverse clinical specialties in medicine, with attention to epistemological and other types of differences in their status, value, and use, as well as about the evolution of the use of cases as reporting guidelines and mechanisms for dissemination continue to emerge.

References


Further Reading