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Improving case study research in medical education: a systematised review

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Abstract

Introduction

Case study research (CSR) is a research approach that guides holistic investigation of a real phenomenon. This approach may be useful in medical education to provide critical analyses of teaching and learning, and reveal the underlying elements of leadership and innovation. There are variations in the definition, design, and choice of methods, which may diminish the value of CSR as a form of inquiry. This paper reports an analysis of CSR papers in the medical education literature. We aimed to describe how CSR has been used and how more consistency might be achieved to promote understanding and value.

Method

A systematised review was undertaken to quantify the number of CSR articles published in scholarly medical education journals over the last 10 years. We applied a typology of CSR proposed by Thomas and Myers to integrate the various ways CSR is constructed.

Results

Of the 362 full-text articles assessed, 290 were excluded as they did not meet the eligibility criteria; 76 of these were titled 'case study'. Of the 72 included articles, 50 used single-case and 22 multi-case design, 46 connected with theory while 26 were atheoretical. In some articles it was unclear what the subject was, or how the subject was being analysed.

Discussion

In this study more articles titled 'case study' did not meet the eligibility criteria than those that did. Well-structured, clearly written CSR in medical education has the potential to increase understanding of more complex situations, but this review shows there is considerable variation in how it is conducted, potentially limiting utility and translation into educational practice. Case study research may be of more value in medical education if researchers more consistently followed principles of design, and harnessed rich observation with connection of ideas and knowledge to engage the reader in what is most interesting.

Introduction

Case Study Research (CSR) is a form of inquiry that can illuminate interesting qualities and deepen knowledge, ¹⁻⁴ but sometimes what is labelled 'case study' has no foundation in research and may lack purpose, integrity or connection to any analytical frame ³.

Professional fields such as accounting, business, education, marketing, public administration and medicine use CSR. In higher education it is proposed that well-structured, clearly written CSR may be useful in providing critical analyses of underlying issues, identifying and challenging assumptions, and 'guiding intelligent action' ⁵. To teach leadership in innovation to educators of health professionals, Harvard's Macy Institute use CSR about educational reform to reveal interwoven elements of change and circumstance. There is a contrasting view that CSR has no generalizability and therefore lacks scientific value ⁶, and a misperception that 'anything goes' ⁷. Lack of definition, ambiguity about design, disagreement about acceptable methods, and inability to apply findings more generally can diminish the value of CSR as a method of inquiry, contribute to questions about reliability, and limit uptake of research findings ^{3, 6, 8}.

Influential CSR authors generally define CSR as a study of a contemporary, real phenomenon, which involves 'thick description' of a subject, through multiple sources of data or multiple methods ^{1, 2, 4}. 'Contemporary' in this context does not preclude describing events that have already happened, but it distinguishes between history as a 'dead past', and 'contemporary' where research participants have lived experience to impart.

Beyond this definition there is variation in the way CSR is conceptualised. For example, Yin (2014) describes three types of CSR – exploratory, descriptive and explanatory, in a single-case or a multiple-case design. Single-case designs are critical, unusual, revelatory, or longitudinal in relation to the theory or propositions of interest. Within a single case there may be embedded units of analysis, but if there are distinct cases in the one study, then a multiple-case design is adopted ⁴. Stake (2005), is more interpretive, distinguishing between an intrinsic case (where the case is dominant), and an instrumental case (where the issues are dominant); and he termed multiple cases a 'collective case' ².

Bassey (1999) differentiates between a theoretical approach where the aim is to understand or illuminate theory, and an evaluative and/or action approach¹. Incorporating theory is broadly valued to guide data collection and analysis, to add to collective knowledge, or to allow ideas to be viewed differently. Some authors advocate only qualitative methods are used^{2,9}, while others regard the collection and analysis of quantitative data useful when it is relevant to the behaviour and events that the case is trying to explain.

Viewing the whole and acknowledging the complexity of many interacting variables is challenging in research as most scientific inquiry is about breaking things down and seeking understanding of the constituent parts³. The natural sciences enhance study reliability by isolating a few variables in many settings and pursue generalisations through induction. In contrast, CSR explores many variables in a single or few settings as it considers social settings as a synergistic interplay of variables including people and circumstance which are often indivisible³. Ideas are represented and explored, but CSR does not hide from its contextual focus or propose generalization. This worldview is most popular in the social sciences but CSR is not confined to this domain. For example, CSR may be used in public health to investigate outbreaks of disease, with epidemiological statistics used to test possible explanations derived from analysis of interviews and field observation.

The divergence of CSR from other research approaches and its use across traditionally distinct philosophies has contributed to CSR being described as an 'intellectual orphan'³, or existing in a 'methodological limbo'¹⁰. Thomas and Myers provide substantial commentary on the epistemological status of CSR³, and propose that a way toward understanding and acceptance is to distinguish the 'ideographic' of CSR from the 'nomothetic' of other research approaches³. Nomothetic research attempts to establish generalizable principles whereas CSR seeks an ideograph, or a 'picture' of the whole. The epistemological viewpoint and design of CSR will vary depending on the phenomenon to be studied and the researcher's experience and perspective. Accordingly, it is likely the researcher will adopt an approach advocated by CSR exponents who have a similar epistemological stance.

Contemporary proponents of CSR have shifted from valuing a foundation of theory to *phronesis*, a type of wisdom or intelligence relevant to practical things. In this reframing of CSR, the critical contribution of the researcher is to learn from the experience of others in

the field of inquiry, carefully reflect to integrate ideas, and consider the topic from a novel angle ¹¹. The study cannot be replicated as each researcher and reader may view the findings differently from a personal perspective; they may each learn something different from it ^{3, 5, 8}.

Attributes of good CSR

Case study is a research approach, rather than a uniform methodology. The approach is used to guide holistic investigation of a real phenomenon in order to advance our knowledge of a broader theme. Often social situations are complex and may consist of many interwoven elements that operate in synergy. An assorted set of methods or data sources may align with the research question and the situation to provide depth of understanding, illuminating features that may have otherwise remained latent. To advance beyond purely description, the researcher must analyse what is interesting about the case. Drawing on the experience and wisdom imparted by participants and the researcher's ability to engage coherently with wider theories, emerging ideas are connected to stimulate the readers' conceptual insight and communicate utility ^{3, 5, 8, 11}. Stated more clearly, a case study is in no way a sample to be considered representative of a wider population, but a particular representation of a phenomenon which may provide insight into underlying patterns, processes, conditions and mechanisms. The most important attributes are the thought and analysis refracted in a narrative that weaves together questions and discovery, recognition and intuition, challenges assumptions and references the particular ³. Proof may not be possible, but the 'imperative of understanding' may be more valuable than proof ¹², allowing new research questions embedded in a conceptual framing to be derived from carefully analysed CSR ¹³. In this way learning from CSR may be transferred to the reader's own situation ⁶.

As there are various ways that CSR is constructed peer-reviewers may have difficulty assessing CSR for publication. To integrate the diverse conceptualisations of CSR, Thomas and Myers (2015) proposed a typology that defines CSR as one of two parts, subject and object ³:

- The *subject*, or the case itself, may be a (local) knowledge case, an unusual (outlier) case, or a revealing (key) case.

- The *object* is the analytical frame through which the *subject* is described.

Thomas and Myers (2015) emphasise careful selection of the two parts, arguing it is the alignment between the *subject* (case), as an instance of a class, and the *object*, or way that the *subject* is scrutinised, that is at the heart of robust CSR ³. While the *object* may emerge as the inquiry progresses, there is generally an object in mind at the outset. The object incorporates the *purpose*, *approach* and *process* of the case study:

- The *purpose*, or reason for doing the study, integrates Stake's terms 'intrinsic' and 'instrumental' ², and 'evaluative' or 'exploratory' used by Bassey ¹ and Yin ⁴.
- The *approach* establishes a theoretical basis at the outset with an aim to test or build on theory, or the approach may be entirely descriptive (atheoretical).
- The process is either:
 - a single-case study design as one with no comparative analysis, which may be studied *retrospectively* in a defined period of time (*snapshot*), or one which describes change over a period of time (*diachronic*).
 - a multiple-case design incorporates embedded units of analysis within a single-case design (*nested*), one or more comparative analyses occurring at the same time (*parallel*), or where they are happening consecutively and the outcome of one (or the time in between) may affect the other (*sequential*).

While this structure may not be in common use, in integrating the different themes and classifications of CSR, we proposed that it would provide a useful framework for reviewing how CSR is reported in the medical education literature. In this study we undertook a review of how CSR articles have been structured and reported in scholarly medical education journals over the last 10 years. We aimed to describe how CSR has been used and how more consistency might be achieved to promote understanding and value.

Methods

A systematized literature review incorporated a systematic search strategy with a tabulated analysis given that there was no common outcome measurement to synthesise ¹⁴. A modified Population, Interest, Context (PICO) review protocol was formulated collaboratively with all authors. As a literature review, ethics approval was not required.

Eligibility criteria

Population

We included in the search all peer-reviewed articles published in scholarly journals from January 2006 to February 2017 that reported primary research of a medical education topic using CSR. This excluded non peer-reviewed articles, books, letters, reports, editorials, perspectives, grey literature; and theses. From the resulting search, we excluded articles where the CSR methods were not discernible, articles where English translation was not available, or where the full text was not available through our library subscriptions.

Interest

CSR was defined as a description of a contemporary event studied in its real-world context, using multiple data sources and/or multiple methods of data collection.

Context

Medical education was defined as a study undertaken at a medical school or other medical training facility including hospitals, or the subject concerned teaching and learning of medical doctors.

Search Strategy

A limited search of PubMed, ERIC, and CINAHL was undertaken using the initial key words “case study”, “medical education”, and additional key words identified from the title and abstract and index terms. A second search was undertaken using all key words identified across PubMed, ERIC, CINAHL, and Informit (Table 1).

Study selection

After automatic and manual removal of duplicate records, one reviewer (CC) screened the title and abstracts of papers against the eligibility criteria, removing non-medical education, non peer-reviewed, and non-case studies. Full-text papers were retrieved for the remaining papers for more detailed analysis against the eligibility criteria.

A random 10% sample of included, and excluded articles that explicitly called the study ‘case study’ was ‘double’ reviewed blind by each of the other authors (RH, PA, JS). That is, three

mutually exclusive 10% samples of included and of excluded articles meant 30% of included and 30% of excluded articles were reviewed twice. The agreement rate of 88.9% was resolved to 100% after discussion but did not result in any additional articles included.

Data abstraction

For each study the author, year, title, and journal, were recorded, and the CSR design according to the typology proposed by Thomas and Myers (2015) was abstracted from the article.

Results

The search strategy identified 1,197 separate articles (Figure 1). Of the 377 articles assessed, 12 were excluded as the full text was not available, and 3 had no readily available English translation. Of the remaining 362 full-text articles, 290 were excluded as they did not meet the eligibility criteria – they did not describe research methods at all, used one data source or one method (eg qualitative interviews at one time-point of one participant group in a ‘single-case study’ design). Of these 290 exclusions, 76 contained ‘case study’ in the article title.

Among the 72 articles included in the review, 10 papers report findings from 4 overarching studies: 3 papers by Rodriguez et al, 1 paper by Lopez-Roig; 2 papers by Van Hoof et al.; 2 papers by Maggio et al; and 2 papers by Preston et al (Appendix 1).

The articles reviewed utilised a CSR approach for a diverse range of topics (Appendix 1). While there was also variety in the design and object of the study, we were able to apply the typology proposed to integrate the range of articles. Most used a single-case design (68%), reported a local case (61%), and were purely exploratory (71%) (Table 2). In spite of the eligibility criteria used to screen articles there remained ambiguity in the design, subject and process. In one article it was not evident whether it was a single or multiple case design. In one article, the object of analysis was determined but neither the subject nor the process were evident. Where the single-case or multiple-case design was unclear it was more difficult to determine how the object was analysed.

The CSR articles in which the structure and design elements were most clearly reported were Skipper et al (2016), Struwig et al (2016), Lund et al (2016), Jippes et al (2013), Isaranuwachai et al (2014), and Christensen et al (2014).

Discussion

In this review more articles titled 'case study' did not meet the eligibility criteria than articles that did meet the eligibility criteria. Case study research (CSR) is reported in academic medical education journals on diverse topics such as teaching medical microbiology, socially accountable medical schools, successful research education, the impact of culture and context on curriculum change, and the cost effectiveness of simulation. Despite CSR's popularity, we found ambiguity in design, subject, and process.

In medicine, the term 'case study' is variously used: as a mock clinical scenario for teaching purposes; to report an interesting clinical presentation; and to report CSR. While all are acceptable uses of the term, the rules surrounding the construction of a 'case study' in each context may be different, and they may or may not have any foundation in research. For example, an educational case study may be modified to enhance learning, but manipulation of facts in research is prohibited; a case study of a clinical presentation is often a narrative description and may not include research methods, whereas CSR requires intentional design and justified research methods. Further confusion may surround the divergence of a CSR approach from other research approaches. In this review the term 'case study' was sometimes incorrectly used to describe a non-CSR approach in single-site studies and/or small sample sizes. Blurring of the different uses of the term 'case study' may be contributing to CSR being poorly understood and poorly reported.

Quality criteria have been defined for reporting other research approaches, but quality criteria do not appear to be consistently applied to reporting CSR. Academic audiences must feel satisfied with the integrity of the study and that the claims being made are supported by the evidence^{4,5}. Perhaps because of the extent of data collected and the need to limit content to prescribed journal formats, some articles in this study reported findings from only one of the collection methods used. Care needs to be taken that the

holistic nature that is the essence of CSR is not lost in carving out publishable sections. If this is the preferred format for reporting though, it should no longer be described as CSR.

The typology provided a useful framework to understand the structure of the reviewed articles, which were based on various conceptual models. Thomas and Myers warn against being rigidly obsessed with exactitude of design and reliability at the expense of imagination and intuition³. In order to enhance the quality of CSR in academic publications we propose clear description of:

- the contemporary phenomenon (subject) or instance to be studied in its real world setting;
- the analytical frame (object) or aspect of the phenomenon to be explained, including the purpose, approach, and process;
- the single-case or multiple-case design and embedded units of analysis where relevant;
- methods that are congruent with the object; and
- multiple methods or multiple data sources used to achieve rich description, should this be relevant to the purpose and available data.

Consistent and thoughtful construction and a commitment to extract relevant and meaningful information rather than simply writing up a description might promote CSR as a valuable method of inquiry and increase the impact of findings.

Limitations

The number of articles reviewed was limited by the search strategy and eligibility criteria. Only studies published in English were included; while this resulted in only three articles excluded from those selected through the search criteria, articles published in other languages could also have been important to this review. It was not feasible to include books and theses in this review, but there may be value in including a broader range of literature in further research to capture more detailed CSR reports. Nevertheless, we included articles that complied with the accepted definition of CSR and contained sufficient description of methods to allow extrapolation to the framework. While the framework may

not yet be widely used, it may be useful in communicating the key ingredients of good CSR regardless of the epistemological viewpoint of the researcher.

Conclusion

Well-structured, clearly written CSR in medical education has the potential to increase understanding of more complex situations through critical analysis and clarification of contributing factors, challenge to assumptions, and guidance for 'intelligent action' that may have relevance more broadly. A review of CSR in medical education over the last 10 years shows considerable variation in how it is conducted, potentially limiting its value in translation into educational practice. Case study research (CSR) may be of more value in medical education if researchers more consistently followed principles of design and reporting as outlined in this paper. Research frameworks for CSR are available, and their application may reduce ambiguity and enhance the value and transferability of output.

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Tables and Figures

Table 1- Search terms and number of results for review of Case Study Research in medical education journals (Filters: Publication date from 2006/01/01 to 2017/02/13)

Database	Search query	Results, <i>n</i>
PubMed	Search (Medical education[Title/Abstract] OR Medical school[Title/Abstract] OR medical train*[Title/Abstract] OR academic medicine[Title/Abstract] OR medical curricul*[Title/Abstract] OR medical student[Title/Abstract]) AND case study[Text Word]	239
CINAHL	((AB Medical education) OR (AB academic medicine) OR (AB medical curriculum) OR (AB medical school*) OR (AB medical student*) OR (AB medical train*)) AND TX case study	768
ERIC	((AB Medical education) OR (AB academic medicine) OR (AB medical curriculum) OR (AB medical school*) OR (AB medical student*) OR (AB medical train*)) AND TX case study	116
InformIT	((AB:"Medical education OR academic medicine OR medical curriculum") OR (AB:medical AB:train*) OR (AB:medical AB:student*) OR (AB:medical AB:school*)) AND (ALLTERMS,FC:"case study")	74

Table 2 - Structure of case study research in articles reviewed from medical education journals 2006 - 2017

Case Study design		n (%)	
	Single	49 (68.1)	
	Multiple	20 (27.8)	
	Multiple but unclear	2 (2.8)	
	<i>Unclear</i>	1 (1.4)	
Subject			
	Key	24 (33.3)	
	Local	44 (61.1)	
	Outlier	3 (4.2)	
	<i>Unclear</i>	1 (1.4)	
Object			
	Purpose	Exploratory	51 (70.8)
		Evaluative	7 (9.7)
		Exploratory/evaluative	4 (5.6)
		Instrumental	2 (2.8)
		Instrumental/exploratory	6 (8.3)
		Intrinsic	1 (1.4)
	Process	Diachronic	15 (20.8)
		Snapshot	22 (30.6)
		Embedded	5 (6.9)
		Retrospective	14 (19.4)
		Parallel	13 (18.1)
		Sequential	2 (2.8)
		<i>Unclear</i>	1 (1.4)
	Approach	Theoretical	46 (63.9)
		Atheoretical	26 (36.1)

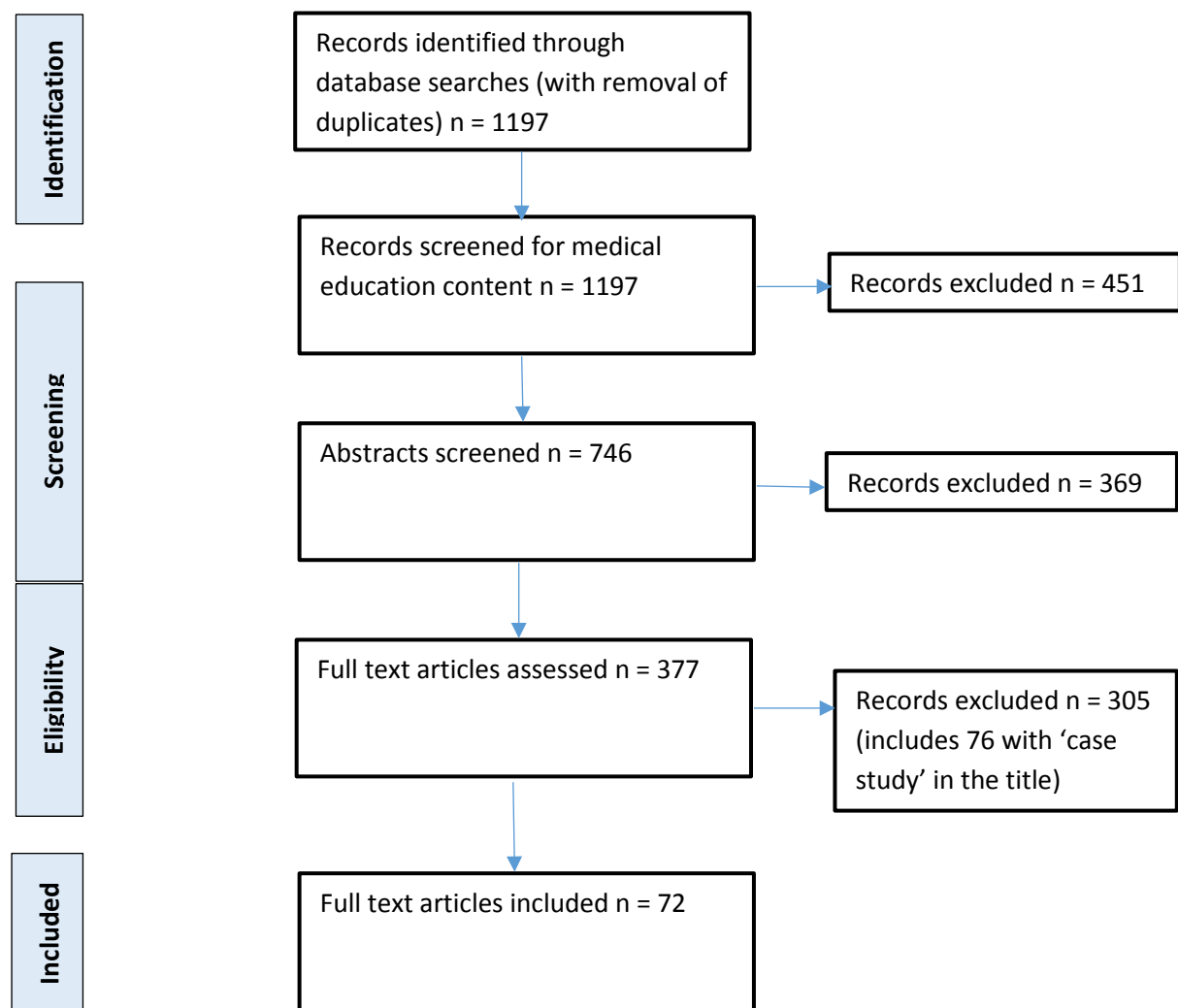


Figure 1 - PRISMA diagram of systematised review of case study research in medical education journals 2006 - 2017

Appendix

Table 2 - Case Study Research articles reviewed and tabulated using Thomas and Myers (2015) typology³

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	unit of analysis/to be explained	Purpose	Process	Approach	Methods
Bac, M., et al. (2015). "Medical education and the quality improvement spiral: A case study from Mpumalanga, South Africa." <i>Afr J Prim Health Care Fam Med</i> 7(1).	single	Quality improvement in medical education - the Mother- and Baby-Friendly initiative (MBFI)	local	the process of inducting students into a longitudinal QI project	exploratory	diachronic	theoretical	qualitative - document review, OSCE notes, student reports
Balmer, D. F., et al. (2015). "How Students Experience and Navigate Transitions in Undergraduate Medical Education: An Application of Bourdieu's Theoretical Model." <i>Advances in Health Sciences Education</i> 20(4): 1073-1085.	single	One medical student cohort's experience of transition from preclinical, to major clinical, to preparation for residency	local	Navigating transitions between medical school and the health system during medical training	exploratory	diachronic	theoretical	qualitative - semi-structured interviews, thematic analysis and theory-informed cluster
Balmer, D. F., et al. (2008). "Understanding paediatric resident-continuity preceptor relationships through the lens of apprenticeship learning." <i>Med Educ</i> 42(9): 923-929.	single	Apprenticeship learning in a community-based paediatric resident training	local	Preceptor relationships in medical education	exploratory	diachronic	theoretical	ethnography, qualitative - interviews and observation, thematic analysis
Bardach, S. H. and G. D. Rowles (2012). "Geriatric Education in the Health Professions: Are We Making Progress?" <i>Gerontologist</i> 52(5): 607-618.	single	curricula in health professions education programs	local	Geriatric education in health professions education	exploratory	snapshot	atheoretical	qualitative - interviews, constant comparative analysis

Improving case study research in medical education: Systematised review

Barnett, S., et al. (2014). "Implementing a virtual community of practice for family physician training: a mixed-methods case study." <i>Journal of Medical Internet Research</i> 16(3): e83-e83.	single	A virtual community of practice for GP training	local	Experience of General Practice trainees	exploratory, evaluative	snapshot	theoretical	mixed methods - survey and interviews
Beaulieu, M., et al. (2008). "Family practice: professional identity in transition. A case study of family medicine in Canada." <i>Social Science & Medicine</i> 67(7): 1153-1163.	multiple	Academic and medical student perceptions of the role of family medicine at 4 medical schools - 2 with primary care orientation, 2 with specialty orientation	local	Professional identity of Family Practice in Canada	exploratory	embedded	theoretical	qualitative - interviews Educators and residents
Brown, C., et al. (2015). "Money makes the (medical assessment) world go round: The cost of components of a summative final year Objective Structured Clinical Examination (OSCE)." <i>Med Teach</i> : 1-7.	single	financial costs of OSCE at one medical school	local	Cost of assessment in medical education	evaluative	retrospective	atheoretical	quantative - financial costs
Campos, J. J., et al. (2009). "Teaching public health in undergraduate medical courses: a case study in three universities in Parana." <i>Sao Paulo Med J</i> 127(6): 335-341.	multiple	The structure of public health educational curricula of three medical schools	local	Public health within undergraduate medical training in Brazil	exploratory	parallel	theoretical	qualitative - interviews, document review
Casey, M. G., et al. (2015). "Diversity and consistency: a case study of regionalised clinical placements for medical students." <i>Aust Health Rev</i> 39(1): 95-100.	single	Achievement of education standards (AQF) across a regional clinical teaching network	local	clinical skills training in medical schools	evaluative	retrospective	atheoretical	quantative
Christensen, M. K. and O. Lund (2014). "Doctoral Education in a Successful Ecological Niche: A Qualitative Exploratory Case Study of the Relationship between the Microclimate and Doctoral Students' Learning to Become a Researcher." <i>International Journal of Higher Education</i> 3(3): 103-113.	single	The microclimate in an ecological niche of doctoral education	key	Successful doctoral education in medical education	exploratory	snapshot	theoretical	qualitative interviews

Improving case study research in medical education: Systematised review

Clark, M. L., et al. (2010). "Musculoskeletal education: a curriculum evaluation at one university." BMC Med Educ 10: 93.	single	Undergraduate musculoskeletal curriculum at one medical school	local	Strengths and weaknesses of musculoskeletal education in medical schools	exploratory	retrospective	theoretical	mixed methods - document review, MCQ exams, evaluation data, interviews
Corwin, S. J., et al. (2007). "Two Models for Implementing Senior Mentor Programs in Academic Medical Settings." Educational Gerontology 33(5): 383-393.	multiple	senior mentoring programs in two medical settings	local	geriatric education in medical schools	exploratory	parallel (<i>retrospective</i>)	atheoretical	qualitative - document review, interview, focus groups
Cresswell, K., et al. (2013). "Patient safety in healthcare preregistration educational curricula: multiple case study-based investigations of eight medicine, nursing, pharmacy and physiotherapy university courses." BMJ Qual Saf 22(10): 843-854.	multiple	Patient safety knowledge taught in 8 healthcare professional preregistration university courses	local	Learning about patient safety	exploratory	parallel	theoretical	qualitative - document review, observations, focus groups, interviews
Duffy, M. C., et al. (2015). "Team Regulation in a Simulated Medical Emergency: An In-Depth Analysis of Cognitive, Metacognitive, and Affective Processes." Instructional Science: An International Journal of the Learning Sciences 43(3): 401-426.	single	Medical team performance during a simulated medical emergency	key	cognitive, affective and metacognitive processes affecting performance	Instrumental , exploratory	snapshot	theoretical	mixed methods - recordings of simulation, de-briefer ratings, interviews
Findyartini, A., et al. (2016). "How clinical reasoning is taught and learned: Cultural perspectives from the University of Melbourne and Universitas Indonesia." BMC Med Educ 16: 185.	multiple	medical student attitudes to clinical reasoning in 2 medical schools	key	The influence of culture of learning on the teaching and learning process in medical training	evaluative	parallel	theoretical	mixed - measure of diagnostic ability, focus group, interview
Frambach, J. M., et al. (2014). "Quiet or Questioning? Students' Discussion Behaviors in Student-Centered Education across Cultures." Studies in Higher Education 39(6): 1001-1021.	multiple	Cross-cultural applicability of PBL	key	cross-cultural differences in communication styles	exploratory	parallel	theoretical	qualitative - field work, interviews,
Frambach, J. M., et al. (2012). "Rethinking the globalisation of problem-based learning: how culture challenges self-directed learning." Med Educ 46(8): 738-747.	multiple	Cross-cultural applicability of PBL	key	How culture and context impact self-directed learning	exploratory	parallel	theoretical	qualitative - field work, interviews,

Improving case study research in medical education: Systematised review

Goldszmidt, M., et al. (2014). "Progressive collaborative refinement on teams: implications for communication practices." <i>Med Educ</i> 48(3): 301-314.	multiple	Medical teaching teams in an internal medicine ward	local	Communication practices that facilitate patient care	instrumental	diachronic	theoretical	qualitative - document review, field notes, case reviews, focus groups
Gray, K., et al. (2010). "Medical students' use of Facebook to support learning: Insights from four case studies." <i>Med Teach</i> 32(12): 971-976.	single	Facebook use by medical students at one university	local	Use of social networking to support medical student learning	exploratory	embedded	theoretical	mixed methods - survey <i>and</i> 'case studies'
Hayes, A. L., et al. (2015). "Understanding intercultural transitions of medical students." <i>Int J Med Educ</i> 6: 26-37.	single	Transition of students from a mainstream Bahraini secondary school with Arabic as first language to an international branch of an English-speaking medical university	outlier	intercultural transitions of medical students	exploratory	snapshot	theoretical	qualitative - interviews, focus groups
Hervatis, V., et al. (2015). "A Conceptual Analytics Model for an Outcome-Driven Quality Management Framework as Part of Professional Healthcare Education." <i>JMIR Med Educ</i> 1(2): e11.	single	<i>unclear</i>	<i>unclear</i>	Use of data analytics to support healthcare education	exploratory	<i>unclear</i>	theoretical	qualitative - observations, interviews
Hosny, S., et al. (2015). "Is our medical school socially accountable? The case of Faculty of Medicine, Suez Canal University." <i>Med Teach</i> 37: S47-55.	single	Faculty of Medicine, Suez Canal University	local	Evaluating medical school social accountability	exploratory	retrospective	theoretical	qualitative - interviews, document review
Howe, A., et al. (2007). "Patient contact in the first year of basic medical training--feasible, educational, acceptable?" <i>Med Teach</i> 29(2-3): 237-245.	single	medical student-patient contact in the first two years of medical training at a new medical school	key	Feasibility of patient contact in early clinical placements	exploratory	diachronic	atheoretical	mixed methods - questionnaire, focus groups, interviews, OSCE examiner comments, survey questions
Isaranuwatthai, W., et al. (2014). "Comparing the Cost-Effectiveness of Simulation Modalities: A Case Study of Peripheral Intravenous Catheterization Training." <i>Advances in Health Sciences Education</i> 19(2): 219-232.	single	Performing IV cannulation -3 training programs of varying fidelity	key	Cost-effectiveness of simulation modalities	evaluative	snapshot	atheoretical	quantitative

Improving case study research in medical education: Systematised review

Jippes, M., et al. (2013). "Impact of national context and culture on curriculum change: A case study." Med Teach 35(8): 661-670.	single	4 medical schools who had adopted integrated medical curricula in a country with high uncertainty avoidance	key	impact of culture and context on curriculum change in medical education	exploratory	snapshot	theoretical	qualitative - interviews, document review
Kilminster, S., et al. (2011). "Preparedness is not enough: understanding transitions as critically intensive learning periods." Med Educ 45(10): 1006-1015.	multiple - <i>unclear</i>	Experiences of Junior (Y1) and specialists doctors at 6 sites transitioning into complex work settings	local	Effects of transitions during medical training on medical performance	exploratory	snapshot	theoretical	qualitative - 6 study hospitals - interviews, document review, observation
Leung, K. H., et al. (2010). "A Reflective Learning Framework to Evaluate CME Effects on Practice Reflection." Journal of Continuing Education in the Health Professions 30(2): 78-88.	multiple	One instance of Reflective Learning Framework (2029 cases)	local	Validation of a Reflective Learning Framework	evaluative	diachronic	atheoretical	interviews, comments (<i>unclear as uses results of separately reported study as another method</i>)
Lopez-Roig, S., et al. (2010). "The reputation and professional identity of family medicine practice according to medical students: a Spanish case study." Aten Primaria 42(12): 591-601.	single	Medical student perceptions of family medicine at a medical school in Spain	local	Reputation and professional identity of Family Medicine	exploratory	diachronic	theoretical	qualitative - focus groups, document analysis
Lu, J., et al. (2010). "Scaffolding Problem-Based Learning with CSCL Tools." International Journal of Computer-Supported Collaborative Learning 5(3): 283-298.	single	teacher scaffolding using interactive whiteboard and traditional whiteboard	local	Use of technology to facilitate problem-based learning	exploratory	sequential	theoretical	qualitative - role play recordings - thematic analysis, content analysis
Lund, O., et al. (2016). "Old habits die hard: a case study on how new ways of teaching colonoscopy affect the habitus of experienced clinicians." Int J Med Educ 7: 297-308.	single	Specialised training program for a colonoscopy service	key	Training the expert clinician to teach	instrumental , exploratory	diachronic	theoretical	Qualitative - interviews and field notes
Luu, N. H., et al. (2009). "Motivation of university and non-university stakeholders to change medical education in Vietnam." BMC Med Educ 9: 49.	single	community-involved curriculum design	local	Stakeholder motivation to change	exploratory	diachronic	atheoretical	qualitative

Improving case study research in medical education: Systematised review

Maggio, L. A. (2016). "Educating physicians in evidence based medicine: current practices and curricular strategies." <i>Perspect Med Educ</i> 5(6): 358-361.	multiple	Teaching and learning EBM in medical schools	local	Challenges faced by instructors and strategies used to teach EBM s in medical schools	exploratory	parallel	atheoretical	qualitative - interviews, document review
Maggio, L. A., et al. (2016). "Challenges to Learning Evidence-Based Medicine and Educational Approaches to Meet These Challenges: A Qualitative Study of Selected EBM Curricula in U.S. and Canadian Medical Schools." <i>Acad Med</i> 91(1): 101-106.	multiple	Teaching and learning EBM in medical schools	local	Challenges faced by instructors and strategies used to teach EBM s in medical schools	exploratory	parallel	atheoretical	qualitative - interviews, document review
Muir, F. and S. Law (2014). "Students' perceptions and experiences of a new "Teaching in Medicine" BMSc intercalated degree programme." <i>Med Teach</i> 36(5): 403-408.	single	student experiences of a BMSc Teaching in Medicine Intercalated degree programme at a university	local	Intercalated medical degree programs	exploratory	snapshot	atheoretical	qualitative - interview and questionnaire
Muntinga, M. E., et al. (2016). "Toward Diversity-Responsive Medical Education: Taking an Intersectionality-Based Approach to a Curriculum Evaluation." <i>Advances in Health Sciences Education</i> 21(3): 541-559.	single	Diversity-related learning objectives and integration of diversity into a medical school curriculum	local	Diversity - responsive medical curricula	exploratory, evaluative	retrospective	theoretical	qualitative - interviews, document review, observation
Nestel, D., et al. (2011). "Implementation of a multi-level evaluation strategy: a case study on a program for international medical graduates." <i>J Educ Eval Health Prof</i> 8: 13.	single	Evaluation strategy for an educational intervention to support international medical graduates	local	Evaluation of educational interventions	evaluative	diachronic	theoretical	mixed methods - interviews, workshop evaluation, website usage stats,
Ong, C. C., et al. (2016). "Beliefs and values about intra-operative teaching and learning: a case study of surgical teachers and trainees." <i>Adv Health Sci Educ Theory Pract</i> 21(3): 587-607.	multiple	Intra-operative teaching and learning	local	Beliefs and values of teachers and trainees	exploratory	parallel	theoretical	qualitative - interviews and independent observation

Improving case study research in medical education: Systematised review

Parry, J., et al. (2008). "More students, less capacity? An assessment of the competing demands on academic medical staff." <i>Med Educ</i> 42(12): 1155-1165.	multiple	Medical schools with increased student numbers	key	impact of expansion on medical schools	exploratory	parallel	atheoretical	qualitative - document review, interviews
Patten, D. (2015). "Using ultrasound to teach anatomy in the undergraduate medical curriculum: an evaluation of the experiences of tutors and medical students." <i>Ultrasound</i> 23(1): 18-28.	unclear	Use of portable ultrasound for teaching anatomy to medical students at two medical schools	local	Experience of staff and students	exploratory	retrospective	atheoretical	mixed methods - document review, interviews, focus groups, module evaluations,
Pearson, S., et al. (2014). "Supporting Medical Students to Do International Field Research: A Case Study." <i>Innovations in Education and Teaching International</i> 51(3): 277-291.	single	International field research of intercalated research medical degree in the UK	local	Health and safety of medical students performing fieldwork	exploratory	snapshot	atheoretical	mixed methods - questionnaires survey, document review
Pereira, M. A., et al. (2015). "Medical student stress: an elective course as a possibility of help." <i>BMC Res Notes</i> 8: 430.	single	Personal changes in medical students who attended an elective course on coping strategies	key	Medical student stress	exploratory	retrospective	atheoretical	qualitative - interviews, recording journal club sessions
Perley, C. M. (2006). "Physician use of the curbside consultation to address information needs: report on a collective case study." <i>J Med Libr Assoc</i> 94(2): 137-144.	multiple	Physician use of curb-side consultation - <i>but unclear what the 'groups' of physicians represented</i>	local	Physician information-seeking behaviour	exploratory	snapshot	atheoretical	qualitative - field notes and interviews
Pimmer, C., et al. (2013). "Mobile learning in resource-constrained environments: a case study of medical education." <i>Med Teach</i> 35(5): e1157-1165.	multiple -unclear if cases were different sites or groups of participants	Adoption of mobile internet technology by undergraduate and postgraduate students for medical learning in Nepal	key	The role of ICT in medical education in developing countries	exploratory	snapshot	theoretical	qualitative - focus groups of students, postgraduates, teachers, faculty

Improving case study research in medical education: Systematised review

Preston, R., et al. (2016). "Building blocks for social accountability: a conceptual framework to guide medical schools." BMC Med Educ 16(1): 227.	multiple	Medical school - 4 of the Training for Health Equity Network (THEnet)	outlier	Building socially accountable medical schools	intrinsic	parallel	theoretical	qualitative - document review, field notes, visits
Preston, R., et al. (2016). "From personal to global: Understandings of social accountability from stakeholders at four medical schools." Med Teach 38(10): 987-994.	multiple	Socially accountable medical schools (4)	outlier	Conceptions of social accountability by staff, students and community members	exploratory	retrospective	theoretical	qualitative, interviews, document review, field notes
Pugsley, L. (2008). "Expectation and experience: dissonances between novice and expert perceptions in medical education research." Med Educ 42(9): 866-871.	single	Perceptions of novices and experts at a one-day research consortium	key	Variable research skills in medical education research	exploratory	snapshot	atheoretical	qualitative - observer notes, reflective participant accounts
Pugsley, L., et al. (2008). "Making a difference: researching master's and doctoral research programmes in medical education." Med Educ 42(2): 157-163.	single	Masters of Med Ed and Doctoral projects contribution to scholarship in medical education	local	Quality of research methods in higher degree studies in medical education	exploratory	embedded	atheoretical	qualitative - website, Document review, surveys, interviews, dissertation review
Quinn, E. M., et al. (2014). "Surgical journal club as a community of practice: a case study." J Surg Educ 71(4): 606-612.	single	A Surgical journal club	local	Learning through a community of practice	exploratory	snapshot	theoretical	qualitative - recording of journal club session, interviews
Quintana, F., et al. (2012). "Assessment of a Complementary Curricular Strategy for Training South African Physicians in a Cuban Medical University." MEDICC Review 14(3): 19-25.	single	Cuban medical training of South African students	key	Factors limiting success of a complementary skills training program	exploratory	retrospective	theoretical	qualitative, document review, interviews, focus groups, survey
Radomski, N. and J. Russell (2010). "Integrated Case Learning: Teaching Clinical Reasoning." Advances in Health Sciences Education 15(2): 251-264.	single	3rd year undergraduate medical students experience of ICL in simulation	local	Clinical reasoning in the Integrated Case Learning (ICL) environment	exploratory	snapshot	theoretical	qualitative - focus group, interviews, document review, field observation

Improving case study research in medical education: Systematised review

Raman, M., et al. (2008). "Gastroenterology fellowship training: approaches to curriculum assessment and evaluation." Can J Gastroenterol 22(6): 559-564.	single	One gastroenterology fellowship program	local	Utilisation of the Kern model of curriculum development for curriculum assessment	instrumental	snapshot	theoretical	qualitative - document review, interview
Rego, P., et al. (2009). "Using a structured clinical coaching program to improve clinical skills training and assessment, as well as teachers' and students' satisfaction." Med Teach 31(12): e586-595.	single	a Structured Clinical Coaching Program to support student learning	local	Evaluation of clinical skills training and assessment	evaluative	retrospective	atheoretical	mixed methods - formative assessment, costs, interviews
Risor, T. (2016). "Trail Blazing or Jam Session? Towards a New Concept of Clinical Decision-making." Anthropol Med: 1-18.	single	intern clinical decision making	key	clinical decision making	exploratory	diachronic	theoretical	qualitative - ethnographic, document review, field notes, interview
Rodriguez, C, et al (2014). "Family physicians' professional identify formation: a study protocol to explore impression management processes in institutional academic contexts."BMC Med Ed 14:184	multiple	4 Medical schools, 4 embedded units	key	Professional identification and reputation of family medicine	exploratory	parallel	theoretical	qualitative - interviews, document review
Rodriguez, C., et al. (2015). "The influence of academic discourses on medical students' identification with the discipline of family medicine." Acad Med 90(5): 660-670.	multiple	Professional identification and reputation of family medicine at 4 Medical schools, 4 embedded units	key	Influence of features, knowledge and skills required, prestige, student and educator attitudes	exploratory	parallel	theoretical	qualitative - interviews, document review
Rodriguez, C., et al. (2012). "Exploring professional identification and reputation of family medicine among medical students: a Canadian case study." Educ Prim Care 23(3): 158-168.	single	Professional identification and reputation of family medicine of medical students	local	medical student perceptions of family medicine	exploratory	snapshot	theoretical	qualitative - interviews, document review
Savage, C. and M. Brommels (2008). "Innovation in medical education: how Linköping created a Blue Ocean for medical education in Sweden." Med Teach 30(5): 501-507.	single	Revolutionary curricular change at Linköping Health University	key	Strategy and Innovation in medical education	exploratory	retrospective	theoretical	qualitative - document review and participant input

Improving case study research in medical education: Systematised review

Seluakumaran, K., et al. (2011). "Integrating an Open-Source Course Management System (Moodle) into the Teaching of a First-Year Medical Physiology Course: A Case Study." <i>Advances in Physiology Education</i> 35(4): 369-377.	single	teaching first year medical physiology through an open-source course management system	local	Use of open-source course management systems to support teaching	evaluative	retrospective	atheoretical	quantitative- Usage stats, exam results, questionnaire,
Sharif-Chan, B., et al. (2016). "An Observational Case Study of Near-peer Teaching in Medical and Pharmacy Experiential Training." <i>Am J Pharm Educ</i> 80(7): 114.	single	near peer teaching used by medical and pharmacy trainees at one academic teaching site	local	Observation and perceptions of near-peer teaching in experiential training	exploratory	embedded	atheoretical	qualitative - observations, interviews
Shershneva, M. B., et al. (2008). "Learning to collaborate: a case study of performance improvement CME." <i>Journal of Continuing Education in the Health Professions</i> 28(3): 140-147.	single	A community-based primary care practice and academic institution collaboration to enhance patient care for hypertension	local	Performance Improvement Continuing Medical Education(PI CME)	exploratory	snapshot	atheoretical	qualitative - participant observation, interviews
Skipper, M., et al. (2016). "Organisation of workplace learning: a case study of paediatric residents' and consultants' beliefs and practices." <i>Advances in Health Sciences Education</i> 21(3): 677-694.	single	clinical paediatric departments - university/regional, different health administration	key	workplace learning in medical specialist training	exploratory	snapshot	theoretical	qualitative - ethnography, focus groups, interview, participant observation
Stebbing, S., et al. (2012). "Blended Learning and Curriculum Renewal across Three Medical Schools: The Rheumatology Module at the University of Otago." <i>Australasian Journal of Educational Technology</i> 28(7): 1176-1189.	single	Development and evaluation of an online module to teach rheumatology to 5th year medicals students	local	Blended learning and curriculum renewal in medical schools	exploratory, evaluative	diachronic	atheoretical	Qualitative - interviews, focus groups, assessments
Struwig, M. C., et al. (2016). "Reasons for Suboptimal Learning in Medical Microbiology." <i>Teaching in Higher Education</i> 21(5): 590-609.	single	student learning with introduction of a medical microbiology board game	key	medical microbiology teaching and learning	exploratory	sequential	theoretical	mixed methods - questionnaires, focus groups

Improving case study research in medical education: Systematised review

Taytiwat, P. F., J Briggs, D The Thai-Australian Health Alliance: A Case Study of Inter-Organisational Collaboration.	single	The Thai-Australian Health Alliance	local	Cross-cultural strategic alliances	exploratory	diachronic	theoretical	qualitative - field notes, interviews, questionnaires, document review
Tomolo, A. M., et al. (2009). "A case study of translating ACGME practice-based learning and improvement requirements into reality: systems quality improvement projects as the key component to a comprehensive curriculum." Postgrad Med J 85(1008): 530-537.	single	Development and evaluation of a PBLI curriculum for residency training	local	Practice-Based Learning and Improvement curriculum for residency training	exploratory, evaluative	diachronic	theoretical	<i>Mixed - questionnaire, interviews, document review</i>
Van Hoof, T. J., et al. (2009). "A case study of medical grand rounds: are we using effective methods?" Acad Med 84(8): 1144-1151.	single	Medical Grand Rounds at an academic medical centre	key	Evidence-based educational practice	Instrumental , exploratory	snapshot	theoretical	Qualitative - document review, focus group, interviews
Van Hoof, T. J., et al. (2009). "Improving medical grand rounds: barriers to change." Conn Med 73(9): 545-551.	single	Medical Grand Rounds at an academic medical centre	key	perceived barriers to improving a Medical Grand Rounds program	Instrumental , exploratory	snapshot	theoretical	Qualitative - document review, focus group, interviews
Wong, A. K. (2011). "Culture in medical education: comparing a Thai and a Canadian residency programme." Med Educ 45(12): 1209-1219.	multiple	anaesthesia residency training programs in Thailand and Canada	key	impact of culture on medical education	Instrumental , exploratory	embedded	theoretical	mixed methods - document review, observations, survey, interviews
Wong, B. M., et al. (2013). "Sustaining quality improvement and patient safety training in graduate medical education: lessons from social theory." Acad Med 88(8): 1149-1156.	single	Implementation of QI/PS curricula in residency clinical training	key	sustainable quality improvement and patient safety training in medical education	exploratory	retrospective	theoretical	qualitative - interviews with participants from different academic institutions in different countries
Wong, YW., et al. (2014). "Teachers' perceptions of and responses to student evaluation of teaching: purposes and uses in clinical education." Assessment & Evaluation in Higher Education 39(4): 397-411.	single	Student evaluation of clinical teaching (SET) in an undergraduate medicine program	local	Clinical teachers perceptions of and responses to SET	instrumental , exploratory	snapshot	theoretical	Qualitative - survey and interview (<i>sequential</i>)

Improving case study research in medical education: Systematised review

Worley, P., et al. (2006). "Empirical evidence for symbiotic medical education: a comparative analysis of community and tertiary-based programmes." Med Educ 40(2): 109-116.	multiple	3rd year medical student perceptions of clinical placements	local	Symbiotic medical education	exploratory	diachronic	atheoretical	Qualitative - student interviews (2 groups, n= 22)
Yates, J. (2011). "Development of a 'toolkit' to identify medical students at risk of failure to thrive on the course: an exploratory retrospective case study." BMC Med Educ 11: 95.	single	Student progress through a medical school	local	Identifying medical students at risk of academic failure	exploratory	retrospective	atheoretical	Mixed - Document review, Student demographics, exam marks,