

Nanomedicine: a socio-technical system

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Recently, nanotechnology, –‘the intentional design, characterization, production, and application of materials, structures, devices, and systems by controlling their size and shape in the nanoscale range (i.e., 1–100 nanometers)’ - has put forward considerable opportunities for healthcare—including novel diagnostic and therapeutic prospects—leading to the emergence of nanomedicine. Together with such technological advancements, social science research has placed increasing attention to this emerging and complex discipline. Still missing, however, is a systematized, coherent understanding of nanomedicine as a discrete socio-technical system. Thus, important research questions for social scientists have remained unaddressed: Can nanomedicine represent a distinctive research context for social sciences? And, if so, why and along which dimensions? And, what theoretical, empirical, and practical agenda may this understanding promote?

By charting the extant literature and drawing on insights from science, innovation, technology, and organizational studies, we review the field of nanomedicine and pinpoint key thematic areas in which the field unfolds. Our analysis of the literature reveals four clusters in which nanomedicine develops. These dimensions include: (i) the transdisciplinary nature of nanomedical technology and innovation; (ii) the products, processes, and loci of innovation in which nanomedicine unfolds; (iii) the opportunities for sustained public engagement; and, (iv) key regulatory and policy challenges and recommendations.

Articles Analyzed from Database Search.

| Database | Search parameters | Shortlisted sources | Thematic areas | | | |
|-------------------|--|---------------------|---------------------|------------|-------------------|------------------------|
| | | | Transdisciplinarity | Innovation | Public Engagement | Regulations and Policy |
| Web of science | Topic (i.e., title, abstract, author, keywords) | 61 | 16 | 9 | 21 | 15 |
| Scopus | Title, abstract, keywords | 57 | 18 | 10 | 12 | 17 |
| Medline pubMed | Anywhere (e.g., abstract, author, document text, document title) | 64 | 11 | 29 | 19 | 5 |

Conceptualizing nanomedicine under this lens represents a valuable approach in both outlining healthcare settings and furthering social theories. Indeed, it enables reaching beyond a somehow deterministic top-down view of a transformative medical field to, instead, a focal set of disruptive innovations and processes. In so doing, this approach offers a contingent opportunity for the simultaneous merging of ‘the technological’ and ‘the social’. As such, our socio-technical analysis reveals that the discussions on nanomedicine should not be developed just on the technology per se but, mostly, on the socio-technical system’s functionality. That is, scholars and practitioners’ discussions should extend to the relationships among the elements required to accomplish the societal roles of the system. These roles can encompass the artefacts, the identities of the social actors involved, the participating organizations, and, nanomedicine’s wider cultural meaning.

Collectively, our work advances both theoretical and practical aspects as to why and how nanomedicine may be best understood as an idiosyncratic setting for the advancement of novel social science research inquiries.



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