

EDITORIAL



Please mind the gap—about equity and access to care in oncology

Health care disparities have been described as differences in the quality of care received by those people who have equal access to care and no difference in preferences or needs for treatment,¹ representing a serious public health concern.² While most literature has shown how ethnic minorities do experience health care disparities and poorer clinical outcomes,²⁻⁴ inequalities are also encountered according to gender, age, socioeconomic status, sexual orientation, patients in rural areas, or the presence of disabilities.¹

While good health and well-being for all at all ages stand as one of the 17 Sustainable Development Goals promoted by the United Nations,⁵ the abovementioned barriers are commonly fostered by geographic isolation and destitution. Such gaps represent a severe challenge in oncology, considering that cancer might be not only a cause but also a consequence of poverty. Indeed, low- and middle-income countries generally experience a high level of health care disparities with scant access to cancer screening and prevention services, vaccinations, as well as state-of-the-art oncological treatments. Particularly, a greater discrepancy is flagrant in the location of radiotherapy (RT) facilities and technologies considering that up to 70% of all the RT hubs are in high-income countries, with 30 countries, in the world, without RT.⁶ Moreover, the chronic impairments due to cancer as well as the oncological treatment costs cast people into poverty.

The recent coronavirus disease-19 (COVID-19) pandemic has sadly confirmed the trend, with the literature recording higher death rates among minority communities in wealthier countries.⁷ Moreover, of the 3.3 billion COVID-19 vaccines administered globally, thus far, only 1% of people in the low-income countries have received at least the first dose, and, dramatically, in Africa, they remain out of reach.⁸

The literature of several medical specialities reported some themes around health care disparities. For example, in surgery,¹ the dominant themes have been recognized as patient-related factors, provider-related factors, system and access issues, clinical care and quality, and post-operative care and rehabilitation.⁹ While many research works have tried to address several problems and efforts around each of the main topics,⁹ the COVID-19 crisis,⁷ with its related disruptions,^{10,11} delays in cancer diagnosis and treatment,^{12,13} and higher mortality rate for certain communities,⁷ has proved that there is still much work to be done

to limit the phenomenon of health care disparities. Several types of vulnerable patients are constantly at risk, despite the theoretical opportunity to get the same overall outcomes of those who experience more favourable conditions.

The situation looks extremely complex. While we still believe that one size cannot fit all,¹⁴ a call for investments, practical tools, tailored solutions, and best practices emerges.^{6,9}

Starting from the results from the previous literature, the present work identifies some major topics with the aim to include the whole spectrum of themes that might lead to disparities in cancer care, highlighting the tentative strategies to facilitate equity and access to care for oncological patients.

SYSTEM-RELATED FACTORS

Under the umbrella of system-related factors, several elements have been discussed by the literature, including sociodemographic factors (like gender, culture, ethnicity), economic situation, geographic locations (low-/middle-income versus high-income countries, rural areas versus city), behaviours (lifestyle, self-monitoring abilities), and care processes (including testing, screening, and counselling services).¹

In such a scenario, social determinants of health (SDOH) play an essential role. They represent “the conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks”.¹⁵ According to the literature, most SDOH can be included in five categories, namely economic stability, education, social and community context, health and health care, neighbourhood, and built environment.

A worrying gap emerges when considering the situation of developing countries. As highlighted by the Global Task Force on Expanded Access to Cancer Care and Control, five crucial points magnify the disparities in oncology between high- and low-/middle-income countries.⁶

The first difference is represented by risk-factor prevention, which stands as one of the winning strategies for fostering lifestyles and behaviours that can prevent the onset of the disease (like avoiding smoking or unhealthy food or stimulating regular fitness activity).¹⁵

The second difference concerns preventing infection related to cancers for which there are no available treatments (human immunodeficiency virus) or for which there are currently vaccines (human papillomavirus, hepatitis B virus).

The third factor is the availability of screening programs for early diagnosis (for instance, promoting tests or checks regularly, or self-assessment—like palpation for breast cancer, Pap test screenings).

The fourth factor relates to the physical and psychological consequences and social matters of survivorship, which can lead to impoverishment, prejudice, and discrimination.

Last but not least, low-income countries often lack the availability of treatment to face cancer-related symptoms and pain (i.e. palliative care, pain control) as well as end-of-life care.⁶

Closing the gap in outcomes for preventable and treatable cancers requires a global effort. While low-/middle-income countries need investments in terms of adequate willingness for health care resources, knowledge, and tools to increase the number of available treatments, a general call for prevention programs emerges worldwide. Free access to counselling services, community engagement,^{16,17} and sensitivity as well as social campaigns might be organized and tailored according to the target population, employing adequate knowledge translation tools¹⁸ to ensure that citizens can understand the importance of prevention,¹⁵ regardless of gender, age, economic status, and race^{16,19} stimulating also co-production dynamics²⁰⁻²² in a multi-stakeholder scenario^{18,23} that become more walkable when the health care resources are fairly allocated.

Psycho-oncological treatment (POT) may improve patient quality of life by reducing stress allowing patients to have clear and well-based decisions. Although POT has been the standard of care in developed countries such as Austria and Germany (OnkoZert), identifying and measuring clinical distress by continuous screening tools could be challenging in countries with fewer resources.²⁴

PROVIDER-RELATED FACTORS

Provider-level factors may refer to issues like implicit or unconscious biases, cultural competencies, years of training and experience, supportive hospital policies, motivation, and awareness of health disparities.¹

Even when considering this topic, worrying differences emerge when investigating different areas of the world.

Seruga et al.²⁵ reported disparities in clinical oncologist workload around Europe with a significantly higher workload of medical oncologists in Eastern European countries (EECs) than in Western European countries (WECs). This was reflected by a higher median number of annual consults (225 in EECs versus 175 in WECs, $P < 0.001$), daily consults (25 in EECs versus 15 in WECs, $P < 0.001$), and the time spent per patient (25 min per new consultation in EECs versus 45 min in WECs). In a comprehensive survey on 93 countries, 66 (71%) exceeded the optimal international standard of 150-175 annual caseload per medical oncologist.²⁶ Alarmingly, in 39 (42%) countries, an oncologist would provide care for >500 patients with cancer, and in 27 (29%) countries (of which 25 in Africa and 2 in Asia), a clinical oncologist would provide care for >1000 new cases of cancers.²⁶ In Honduras, there are fewer than 20

oncologists for a population of 8 million and, in Ethiopia, 4 oncologists for >80 million people.⁶ In contrast to the data of mortality-to-incidence ratio in the high-income countries, Africa presented an exceeding >70% mortality-to-incidence ratio in 21 countries (66%) and Asia in 5 countries (26%).²⁶

Available treatment options can increase the complexity of treatment decisions, inducing high psychological distress, making patients less adherent to treatment recommendations. Undoubtedly, higher capital invested in oncological health care may support low-income countries in defining better screening tools, therapies, and general oncological care.²⁷ The different speeds of development in high- versus middle—low-income countries concern the availability of technology. While developing nations still struggle with the absence of assigned hubs and non-qualified staff and structures, developed countries are experiencing an exciting technological revolution. New technologies like artificial intelligence, machine learning,²⁸ and mixed and augmented reality²⁹ represent today the next frontier to ease and expedite cancer diagnosis³⁰ and surgical decision-making.³¹ Searching for the best human—machine interaction is one of the major challenges to enjoy the benefits provided by the new technologies,³² including fostering equity and social sustainability in the best cancer care. Indeed, developing countries lacking resources may upskill their staff and procedure through telemedicine devices⁶ and free e-resources.³³ The recent literature has underlined how tele-oncology has proved to be effective to train and create collaboration between low- and high-income countries as well as mitigating the gap in access to care and clinical outcomes in developing nations,^{34,35} as reported by the Cambodian experience.³⁶ Exchange programs among hospitals and health care institutions around the world have also proved to be worthwhile to fuel human resources capability.³⁷

Considering the health care staff, the literature has stressed how a diverse clinical workforce can facilitate the sensitiveness and attention towards the inequalities in care.^{14,38,39} Ensuring diversity in clinical staff has proved to reach higher patient satisfaction and better clinical outcomes,^{40,41} as professionals who are already keen on bridging the gaps with their peers¹⁴ may be more willing to do so also in dealing with their patients.

If diversity can support the sensitivity and engagement towards the management of different patients, knowledge and skill gaps of clinicians may remain, opening up to the topic of clinical education and training.

ACCESS ISSUES

The improvement of globally equal access to cancer treatment, vaccines, and high technologies needs financial resources, political cooperation, adequate management processes, and cost optimizations. International efforts should speed up to flatten differences in screening, diagnostic, surgical, oncological, and RT willingness around the world. Indeed, high costs and scant availabilities of cancer treatments are the greater barriers in developing countries. To face this gap, an international consensus with a list of

essential drugs, vaccines, and treatment technologies is needed to achieve more affordable and sustainable access to oncological care. Since 1977, the World Health Organization (WHO) created a Global Action Plan for non-communicable diseases with the aim to cover at least 80% of essential medicines and technologies in 2025. Leading societies, such as the American Society of Clinical Oncology, the European Society of Medical Oncology, and the Union of International Cancer Control, have been involved in this outstanding task force providing a list of essential medicines for adult and paediatric oncological care. The above-reported list aimed to allow for greater access to anti-cancer agents fostering therapies, especially in low- and middle-income countries.⁴² Even if, in the last years, the WHO improved access to antineoplastic agents worldwide,⁴³ accessibility in low–middle- and low-income countries remains insolvent leading to high out-pocket costs for oncological medicines on the WHO list of essential medicines.⁴⁴ To note that new, more expensive targeted agents appear very infrequently available or not available at all in the middle- and low-income countries except for Brazil, Colombia, and Turkey, exposing that the WHO goal remains distant.⁴⁴ Systemic therapies need sustainable costs (also considering that a more significant number of essential chemotherapy are off-patent) as well as supportive infrastructures, adequate management processes and information systems, and skilled personnel in their safe preparation and administration.

Among oncological treatments, RT is indicated in ~50% of tumours, and it is crucial for locally advanced and inoperable cancers. Still, as underlined, it remains insufficient or nonexistent in many countries. To offer safe and effective RT treatment is fundamental to provide equipment, specific structures, trained staff for treatments, and adequate maintenance of RT tools. To exemplify, in 2020, Ethiopia had only six radiation oncologists and a single cobalt-60 teletherapy machine for a population of around 100 million inhabitants. As a consequence, the median waiting time in a curative setting was around 150 days, and most RT treatments ended up as palliative.⁴⁵ In Nigeria, the average waiting time before RT could be nearly a year for prostate and breast cancers since the country only has three cobalt-60 teletherapy machines for a population of >200 million inhabitants.⁴⁶ Such delays before RT may hamper the patient's prognosis. It should be stressed that such low-income countries heavily rely on outdated RT equipment, such as cobalt-60 teletherapy machines, which may increase RT-induced toxicity compared with modern RT techniques currently available in other places of the world.

Palliative and compassionate care also play a worldwide role in oncology, but above all, in the low-income countries where patients are often firstly evaluated when the tumour is advanced.

In countries where most health care services are on the National Health System, the issues related to access to care may be mitigated. Still, even in developed countries, adequate access to care may be influenced by current health care and hospitals' policies and guidelines, cost

containment strategies following continuous budget cuts,⁴⁷ data systems, and electronic records.^{1,16} Worldwide, financial mitigation policies^{6,16} can constitute alternative payment models and assistance programs to ensure equitable receipt of high-quality cancer care.⁴⁸

CLINICAL CARE AND QUALITY

Clinical care and quality factors refer to patient-centredness attitudes (e.g. patient satisfaction, shared decision making,⁴⁹ and perceived quality of care⁵⁰), the presence of supportive technology (including electronic health records), quality improvement strategies, and hospital characteristics (including regionality, volume and quality, safety, and practice variation). Therefore, clinical care and quality factors may be responsible for a large proportion of between-hospital differences in clinical outcomes.¹ In the face of treatment resource scarcity, oncological programs might be controlled from the beginning and retrospectively in order to understand the room for improvement.

Policies, systems, environments, and practices that improve equitable participation in all research activities should be promoted, including clinical trials, population science, health services research, and community-based participatory research.⁴⁸ The Global Task Force on Expanded Access to Cancer Care and Control highlights how the research questions look different in oncology worldwide. While in the wealthier countries, oncologists are interested in studying new treatment approaches, in the low- and middle-income countries, the topics concern epidemiology, ramp-up technological services, and creation of oncological guidelines in resource-restricted settings.⁶ Therefore, more specifically, researchers and scientists should employ recruitment strategies able to grant adequate representation of key groups at risk of disparate toxicity or mortality outcomes for the disease or treatment of interest. Individual patient factors such as socioeconomic status, race or ethnicity, and location of residence should not represent barriers in the recruitment process.⁴⁸ Again, a multi-stakeholder approach, partnering with universities, other research centres, private organizations, and non-profit entities,⁵¹ may help overcome the inequalities in access to experimental trials,⁴⁸ as well as a diverse clinical workforce. Nevertheless, conducting clinical trials in developing countries is challenging both for organizational reasons, notably lack of financial resources, managerial culture, and dedicated personnel and infrastructures, and presence of diverse regulatory obstacles.⁵² In addition, cancers are a leading cause of mortality not only in high-income countries but also in the less developed part of the world, where although infectious disease and starvation burden remain predominant, cancer incidence and mortality rates are increasing most rapidly. Indeed, the expected progression in the following 20 years is 28.4 million cases (47% increase) with a significantly higher increase in low-income countries as compared to high-income countries (64% to 95% versus 32% to 56% respectively), placing cancer burden as the greatest health issue in developing regions.⁵³

REHABILITATION AND SURVIVORSHIP

Post-operative care and oncological rehabilitation pertain to patient management beyond hospital stays or after discharge. Health care disparities may arise on longer-term outcomes according to post-operative care and rehabilitation experience.¹ The long-term morbidities due to cancer as well as treatments often lead to disabilities causing a high psychological and financial cost for the patients and caregivers. Oncological patients often need to go back to their everyday life as soon as possible. If survivorship programs also using specific co-production dynamics^{23,54} is a rising standard of care in developed countries,⁵⁵ the equity in the access of survivorship services should be the standard in the poorest countries where disabilities related to cancer often cause further discrimination.⁶ In his perspective, telemedicine can become precious and an effective tool to train patients, communities, and health care staff.

CONCLUSIONS

The oncological gap worldwide stands as a painful reality, involving several aspects of health care: prevention, diagnosis, treatment, incidence, mortality, survivorship, managerial culture, and personnel training. Closing this gap is an ethical imperative. Considering that ‘one size does not fit all’, a realistic analysis of the long-term and short-term needs of each country is crucial to define better plans of action that should and could be adopted so that good health and well-being can be ensured to everybody.

The recent COVID-19 pandemic with its related health care disruptions has further stressed the need to ensure equity in access to high-quality cancer care. In this work, a renowned thematic framework has been adapted to underline the main barriers and issues that can prevent cancer patients from enjoying the same level of health care. While inequalities can be generated from different patients’ characteristics, providers’ factors, issues in the access to the system, different levels and quality of care, and opportunities for rehabilitation after cancer treatments or survivorship programs, some tentative strategies can be identified as summarized in their national and policy recommendations by Prager et al.⁵⁶ In particular, as authors reported, it is crucial: (i) to use the financial resources efficiently; (ii) to encourage the geographic accessibility to cancer services; (iii) to incentivize collaborative projects on cancer management; (iv) to offer tools to providers; (v) to build cancer service packages (including practice guidelines); (vi) to accomplish long-term care program; (vii) to guarantee adequate insurance coverage; (viii) to invest on cancer registries and health information systems.⁵⁶

Low- and middle-income countries should represent a priority in the global scenario, as most of them experience a worrying lack of equipment, oncology-related structures, adequate health care management processes, and staff. As a result, most of the population does not get access to oncological care. Ensuring sufficient financial resources may

represent only part of the solution, as, in several countries, the organization gaps, as well as cultural issues, may still undermine the final results. International cooperation of knowledge sharing, education through scholarships for young clinicians and health care managers, exchange programs, e-resources, free mentoring through the use of technology, and awareness campaigns for the population may stand as accompanying measures to mitigate the gaps, along with equipment availability.

Still, inequalities in access to oncological care affect also high-income countries. First of all, there is a need to promote prevention using adequate knowledge translation tools. Recent experiences have proved how the outcomes can be more satisfactory if cancer patients are supported by their community with a multi-stakeholder approach, including financial plans and aids when treatments are on patients. Diversity in the clinical workforce can improve the sensitivity towards inequalities, also in the access to clinical trials. Technologies can support both clinical staff and patients in gathering, transferring, and sharing knowledge, supporting clinical and shared decision making, monitoring rehabilitation, and fostering co-production of oncological care.

While the gap is to be minded, there is a call for the scientific and clinical communities to share their efforts, experiences, best practices, lessons learned, and solutions around the five themes to mitigate inequalities.

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REFERENCES

- Torain MJ, Maragh-Bass AC, Dankwa-Mullen I, et al. Surgical disparities: a comprehensive review and new conceptual framework. *J Am Coll Surg*. 2016;223(2):408-418.
- Hisam B, Zogg CK, Chaudhary MA, et al. From understanding to action: interventions for surgical disparities. *J Surg Res*. 2016;200(2):560-578.
- Haider AH, Scott VK, Rehman KA, et al. Racial disparities in surgical care and outcomes in the United States: a comprehensive review of patient, provider, and systemic factors. *J Am Coll Surg*. 2013;216(3):482-492.e12.
- Elk R, Felder TM, Cayir E, Samuel CA. Social inequalities in palliative care for cancer patients in the United States: a structured review. *Semin Oncol Nurs*. 2018;34(3):303-315.
- UN. Goal 3. *Ensure healthy lives and promote well-being for all at all ages*. SDGs. 2021. Available at: <https://sdgs.un.org/goals/goal3>. Accessed August 9, 2021.
- Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries. Closing the Cancer Divide: A Blueprint to Expand Access in Low and Middle Income Countries. Available at <https://ncdalliance.org/resources/closing-the-cancer-divide-a-blueprint-to-expand-access-in-low-and-middle-income-countries-by-the-global-task-force-on-expanded-access-to-cancer-care>. Accessed August 9, 2021.
- Bonner SN, Wakam GK, Kwayke G, Scott JW. COVID-19 and racial disparities. *Ann Surg*. 2020;272(3):e224-e225.
- KFF. Tracking Global COVID-19 Vaccine Equity. Available at <https://www.kff.org/global-health-policy/issue-brief/tracking-global-covid-19-vaccine-equity/>. Accessed August 9, 2021.
- Haider AH, Dankwa-Mullen I, Maragh-Bass AC, et al. Setting a national agenda for surgical disparities research recommendations from the National Institutes of Health and American College of Surgeons Summit. *JAMA Surg*. 2016;151(6):554-563.
- Cobianchi L, Pugliese L, Peloso A, Dal Mas F, Angelos P. To a new normal: surgery and COVID-19 during the transition phase. *Ann Surg*. 2020;272:e49-e51.
- Tseng J, Roggin KK, Angelos P. Should this operation proceed? When residents and faculty disagree during the COVID-19 pandemic and recovery. *Ann Surg*. 2020;272(2):e157-e158.
- Bardet A, Frasnin AM, Marghadi J, et al. Impact of COVID-19 on healthcare organisation and cancer outcomes. *Eur J Cancer*. 2021;153:123-132.
- Hartman HE, Sun Y, Devasia TP, et al. Integrated survival estimates for cancer treatment delay among adults with cancer during the COVID-19 pandemic. *JAMA Oncol*. 2020;6(12):1881-1889.
- Cobianchi L, Dal Mas F, Angelos P. One size does not fit all—translating knowledge to bridge the gaps to diversity and inclusion of surgical teams. *Ann Surg*. 2021;273(2):e34-e36.
- Doll KM. Investigating Black-White disparities in gynecologic oncology: theories, conceptual models, and applications. *Gynecol Oncol*. 2018;149(1):78-83.
- Kronenfeld JP, Graves KD, Penedo FJ, Yanez B. Overcoming disparities in cancer: a need for meaningful reform for Hispanic and Latino cancer survivors. *Oncologist*. 2021;26(6):443-452.
- Presch G, Dal Mas F, Piccolo D, Sinik M, Cobianchi L. The World Health Innovation Summit (WHIS) platform for sustainable development. From the digital economy to knowledge in the healthcare sector. In: Ordonez de Pablos P, Edvinsson L, eds. *Intellectual Capital in the Digital Economy*. Routledge, London: Routledge; 2020:19-28.
- Dal Mas F, Biancuzzi H, Massaro M, Miceli L. Adopting a knowledge translation approach in healthcare co-production. A case study. *Manag Decis*. 2020;58(9):1841-1862.
- Gibbon S. Family medicine, 'La Herencia' and breast cancer; understanding the (dis)continuities of predictive genetics in Cuba. *Soc Sci Med*. 2011;72:1784-1792.
- Batalden M, Batalden P, Margolis P, et al. Coproduction of healthcare service. *BMJ Qual Saf*. 2016;25(7):509-517.
- Peterson C, Batalden P, Fritzell P, Borst S, Hedberg B. Exploring the meaning of coproduction as described by patients after spinal surgery interventions. *Open Nurs J*. 2019;13(1):85-91.
- Dal Mas F, Biancuzzi H, Massaro M, Barcellini A, Cobianchi L, Miceli L. Knowledge translation in oncology. a case study. *Electron J Knowl Manag*. 2020;18(3):212-223.
- Cobianchi L, Dal Mas F, Massaro M, et al. Hand in hand: a multi-stakeholder approach for co-production of surgical care. *Am J Surg*. 2021. <https://doi.org/10.1016/j.amjsurg.2021.07.053>.
- Loth FL, Meraner V, Holzner B, Singer S, Virgolini I, Gamper EM. Following patient pathways to psycho-oncological treatment: identification of treatment needs by clinical staff and electronic screening. *Psychooncology*. 2018;27(4):1312-1319.
- Seruga B, Sullivan R, Fundytus A, et al. Medical oncology workload in Europe: one continent, several worlds. *Clin Oncol (R Coll Radiol)*. 2020;32(1):e19-e26.
- Mathew A. Global survey of clinical oncology workforce. *J Glob Oncol*. 2018;4:1-12.
- Cavalli F, Atun R. Towards a global cancer fund. *Lancet Oncol*. 2015;16(2):133-134.
- Loftus TJ, Filiberto AC, Balch J, et al. Intelligent, autonomous machines in surgery. *J Surg Res*. 2020;253:92-99.
- Dal Mas F, Piccolo D, Edvinsson L, Skrap M, D'Auria S. Strategy innovation, intellectual capital management and the future of healthcare. The case of Kiron by Nucleode. In: Matos F, Vairinhos V, Salavisa I, Edvinsson L, Massaro M, eds. *Knowledge, People, and Digital Transformation: Approaches for a Sustainable Future*. Springer, Cham: Springer; 2020:119-131.
- Mascagni P, Vardazaryan A, Alapatt D, et al. Artificial intelligence for surgical safety: automatic assessment of the critical view of safety in laparoscopic cholecystectomy using deep learning. *Ann Surg*. 2020. <https://doi.org/10.1097/SLA.0000000000004351>.
- Loftus TJ, Tighe PJ, Filiberto AC, et al. Artificial intelligence and surgical decision-making. *JAMA Surg*. 2020;155(2):148-158.
- Yang G-Z, Cambias J, Cleary K, et al. Medical robotics. Regulatory, ethical, and legal considerations for increasing levels of autonomy. *Sci Robot*. 2017;2(4).
- Garcia Vazquez A, Verde JM, Dal Mas F, et al. Image-guided surgical e-learning in the post-COVID-19 pandemic era: what is next? *J Laparoendosc Adv Surg Tech*. 2020;30(9):993-997.
- Qaddoumi I, Mansour A, Musharbash A, et al. Impact of telemedicine on pediatric neuro-oncology in a developing country: the

- Jordanian-Canadian experience. *Pediatr Blood Cancer*. 2007;48(1):39-43.
35. Hazin R, Qaddoumi I. Teleoncology: current and future applications for improving cancer care globally. *Lancet Oncol*. 2010;11(2):204-210.
 36. Kvedar J, Heinzelmann PJ, Jacques G. Cancer diagnosis and telemedicine: a case study from Cambodia. *Ann Oncol*. 2006;17(suppl 8):viii37-viii42.
 37. Cobianchi L, Dal Mas F, Peloso A, et al. Planning the full recovery phase: an antifragile perspective on surgery after COVID-19. *Ann Surg*. 2020;272(6):e296-e299.
 38. Gardner AK, Harris TB. Beyond numbers: achieving equity, inclusion, and excellence. *Ann Surg*. 2020;271(3):425-426.
 39. El-Deiry WS, Giaccone G. Challenges in diversity, equity, and inclusion in research and clinical oncology. *Front Oncol*. 2021;11:1-4.
 40. Crown A, Berry C, Khabele D, et al. The role of race and gender in the career experiences of Black/African-American Academic Surgeons: a survey of the Society of Black Academic Surgeons and a call to action. *Ann Surg*. 2021;273(5):827-831.
 41. ASA. *Ensuring equity, diversity, and inclusion in academic surgery*. Beverly, MA: American Surgical Association; 2018.
 42. Eniu A, Torode J, Magrini N, Bricalli G. Back to the “essence” of medical treatment in oncology: the 2015 WHO Model List of Essential Medicines. *ESMO Open*. 2016;1(2):e000030.
 43. Global Essential Medicines. Countries. Available at <https://global.essentialmeds.org/dashboard/countries>. Accessed August 30, 2021.
 44. Cherny NI, Sullivan R, Torode J, Saar M, Eniu A. ESMO International Consortium Study on the availability, out-of-pocket costs and accessibility of antineoplastic medicines in countries outside of Europe. *Ann Oncol*. 2017;28(11):2633-2647.
 45. Rick T, Habtamu B, Tigeneh W, et al. Patterns of care of cancers and radiotherapy in Ethiopia. *J Glob Oncol*. 2019;5:1-8.
 46. Tumba N, Adewuyi SA, Eguzo K, Adenipekun A, Oyeseun R. Radiotherapy waiting time in Northern Nigeria: experience from a resource-limited setting. *Ecancermedicalscience*. 2020;14:1097.
 47. Sousa MJ, Dal Mas F, Lopes Da Costa R. Advances in health knowledge management: new perspectives. *Electron J Knowl Manag*. 2021;18(3):407-411.
 48. Patel MI, Lopez AM, Blackstock W, et al. Cancer disparities and health equity: a policy statement from the American Society of Clinical Oncology. *J Clin Oncol*. 2020;38(29):3439-3448.
 49. Shay LA, Lafata JE. Where is the evidence? A systematic review of shared decision making and patient outcomes. *Med Decis Making*. 2015;35(1):114-131.
 50. Brunoro-Kadash C, Kadash N. Time to care: a patient-centered quality improvement strategy. *Leadersh Heal Serv*. 2013;26(3):220-231.
 51. Cobianchi L, Dal Mas F, Piccolo D, et al. Digital transformation in healthcare. The challenges of translating knowledge in a primary research, educational and clinical centre. In: Soliman KS, ed. *International Business Information Management Conference (35th IBIMA), 1-2- April, Seville, Spain*. IBIMA; 2020:6877-6888.
 52. Alemayehu C, Mitchell G, Nikles J. Barriers for conducting clinical trials in developing countries—a systematic review. *Int J Equity Health*. 2018;17(1):37.
 53. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021;71(3):209-249.
 54. Biancuzzi H, Dal Mas F, Miceli L, Bednarova R. Post breast cancer coaching path: a co-production experience for women. In: Paoloni P, Lombardi R, eds. *Gender Studies, Entrepreneurship and Human Capital. IPAZIA*. Cham: Springer; 2019:11-23.
 55. Bednarova R, Biancuzzi H, Rizzardo A, et al. Cancer rehabilitation and physical activity: the “Oncology in Motion” project. *J Cancer Educ*. 2020. <https://doi.org/10.1007/s13187-020-01920-0>. In press.
 56. Prager GW, Braga S, Bystricky B, et al. Global cancer control: responding to the growing burden, rising costs and inequalities in access. *ESMO Open*. 2018;3(2):e000285.