Telemedicine (radiomedicine..) come in!

**Medicina digitale, intelligenza artificiale, big data: un cambiamento dirompente
A cosa ci porterà?**

Digital health is a cultural transformation of traditional healthcare

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Abstract: Under the term "digital health", advanced medical technologies, disruptive innovations and digital communication have gradually become inseparable from providing best practice healthcare. While the cost of treating chronic conditions is increasing and doctor shortages are imminent worldwide, the needed transformation in the structure of healthcare and medicine fails to catch up with the rapid progress of the medical technology industry. This transition is slowed down by strict regulations; the reluctance of stakeholders in healthcare to change; and ignoring the importance of cultural changes and the human factor in an increasingly technological world. With access and adoption of technology getting higher, the risk of patients primarily turning to an accessible, but unregulated technological solution for their health problem is likely to increase. In this paper, we discuss how the old paradigm of the paternalistic model of medicine is transforming into an equal level partnership between patients and professionals and how it is aided and augmented by disruptive technologies. We attempt to define what digital health means and how it affects the status quo of care and also the study design in implementing technological innovations into the practice of medicine.

Keywords: Digital health; medical technology; self-tracking; paradigm shift; digital transformation
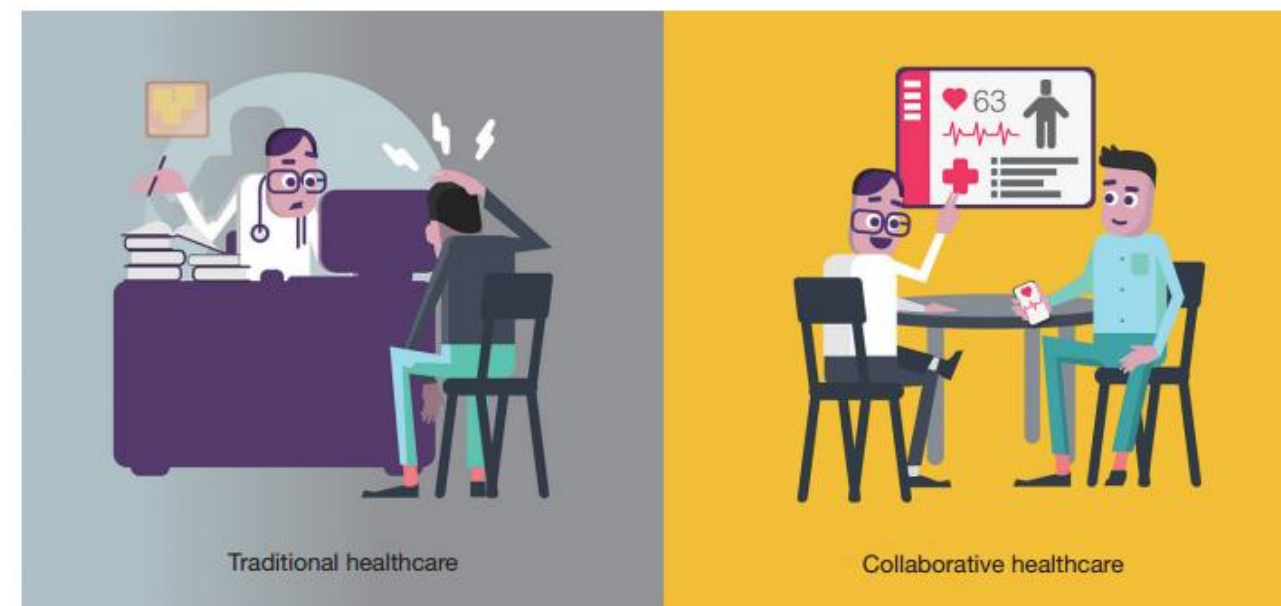
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mHealth, 2017

Figure 1 Comparison of traditional and digital health based medical practices.

Table 2 The differences between traditional and modern healthcare following the digital health transformation

Traditional medicine	Modern medicine
Point-of-care is the clinic or lab	Point-of-care is the patient
Based on populations	Based on the individual
Hierarchy	Partnership
Prescriptions and orders	Collaboration
Data owned by institutions	Data owned and shared by the patient
Individual experience dominates	Limitless data analyses
Physicians as authority	Physicians as guides
Ivory tower	Social media
Expensive	Costs driven down by Moore's law

Soluzioni IA per carenze sanitarie

Accesso a specialistica

Telemedicina assistita da IA per consulenze a distanza.

Diagnosi efficace

Algoritmi IA per analisi di immagini mediche e diagnosi precoce.

Monitoraggio malattie croniche

Sistemi IA per monitoraggio remoto e gestione delle terapie.

Forum Risk Management
obiettivo sanità salute

Gestione delle emergenze con IA

1 **Triage automatizzato**

L'AI assegna priorità ai pazienti in base alla gravità.

2 **Supporto decisionale**

Algoritmi assistono i medici nelle decisioni rapide e salvavita.

3 **Ottimizzazione risorse**

L'IA coordina l'uso efficiente di risorse limitate durante le emergenze e gli eventi di massa
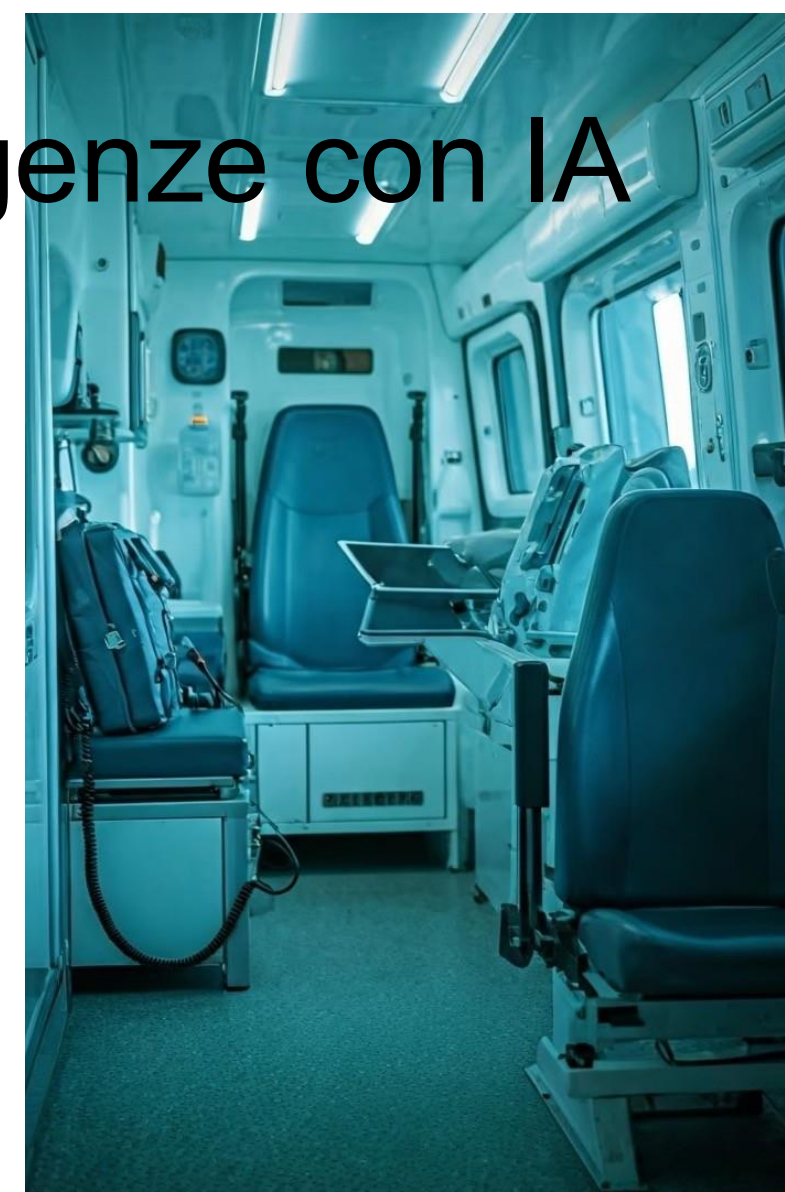
Continuità delle cure

1 — Problema
Interruzioni nel percorso di cura tra medici e isole.

2 — Soluzione IA
Fascicoli sanitari digitali accessibili a distanza.

3 — Esempio
FSE nelle isole greche per pazienti cronici.
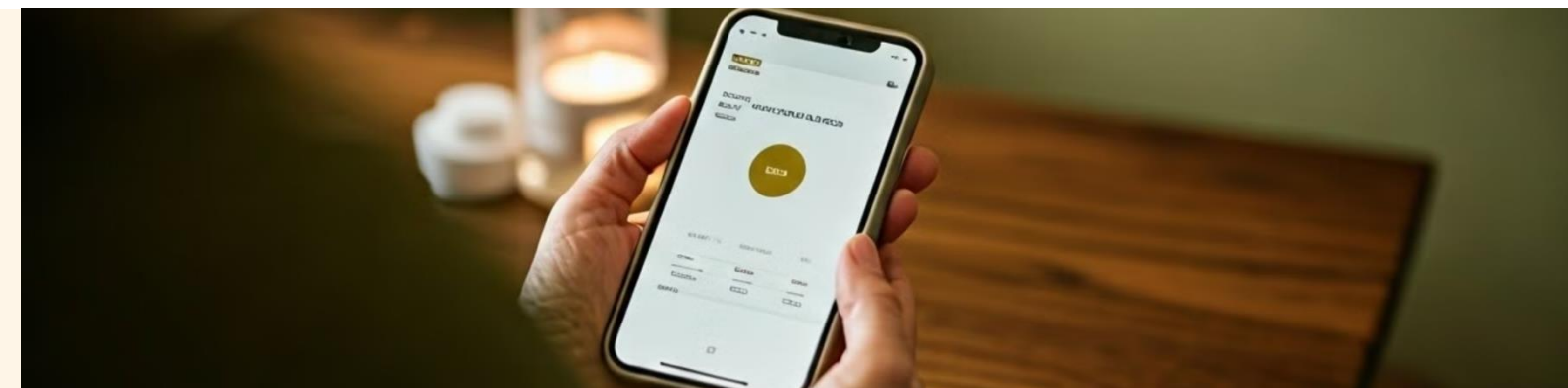
Carenza di personale

Problema

Mancanza cronica di personale sanitario qualificato nelle isole.

Soluzione IA

Automazione di operazioni come gestione farmaci e diagnostica base.

Esempio

Robot IA per gestione farmaci nelle Isole Faroe.

Aderenza terapeutica

Problema
Bassa aderenza alle terapie per mancanza di monitoraggio costante.

Soluzione IA
Sistemi di promemoria automatici basati su IA.

Esempio
App IA per monitoraggio terapie in comunità indigene australiane.

Formazione del personale

1 **Problema**
Accesso limitato a formazione continua per personale sanitario isolano.

2 **Soluzione IA**
Programmi di e-learning interattivo e simulazioni IA.

3 **Esempio**
Simulazioni IA per formazione medica nelle isole Hawaii.
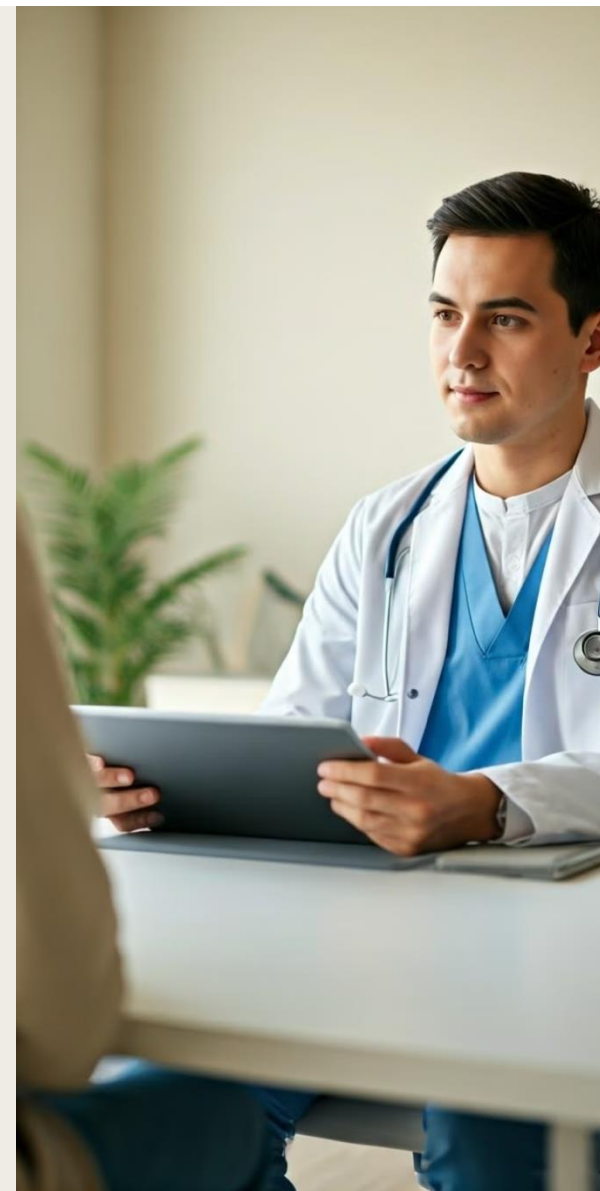
Costi

Costo per isola

€200.000 - €500.000 per infrastrutture digitali
.

€100.000 - €300.000 per licenze e integrazione software IA

€200.000 - €500.000 per centri ambulatoriali con apparecchiature dedicate e integrate.

€50.000 - €100.000 per formazione e aggiornamento del personale

€100.000 - €200.000 per manutenzione e aggiornamenti annuali

Telemedicina e accesso specialistico

Software
€50.000 - €150.000 per isola.

Apparecchiature
€20.000 - €50.000 per isola.

Sistemi diagnostici avanzati
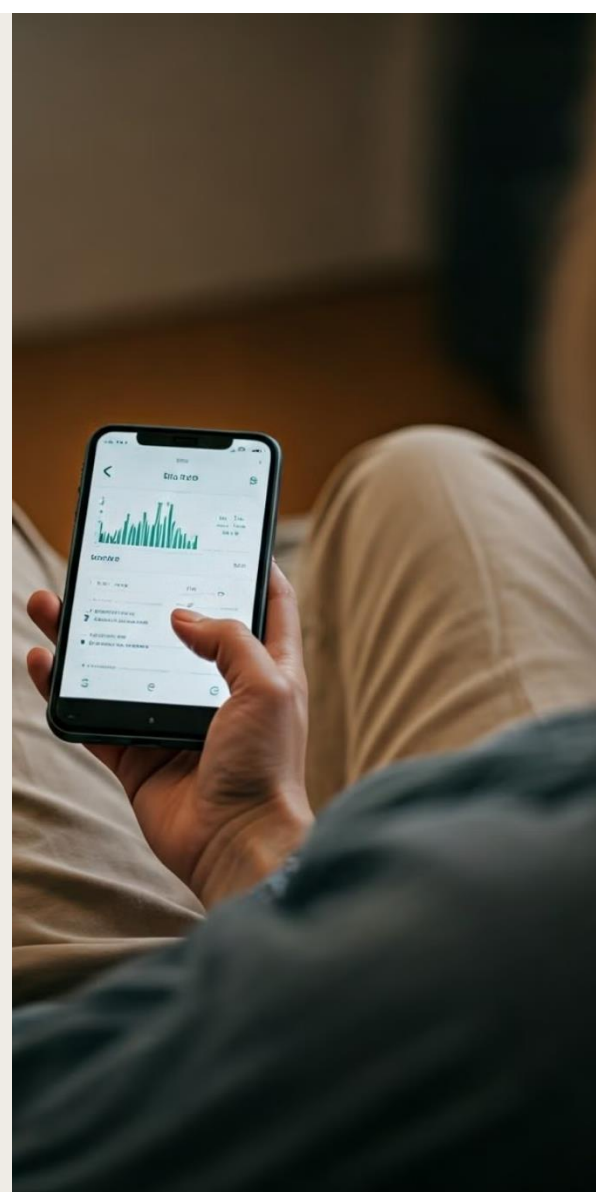
1 **Licenze IA**
€100.000 - €300.000 per analisi diagnostiche.

2 **Apparecchiature**
€200.000 - €400.000 per isola (Rx, TAC).

Monitoraggio malattie croniche e prevenzione/gestione eventi acuti

Sensori
€10.000 - €30.000 per isola.

Software IA
€50.000 - €100.000 per monitoraggio.

Triage AI
€100.000 - €250.000 per isola.

FSE con IA
€110.000 - €330.000 per isola.

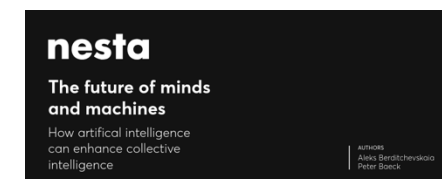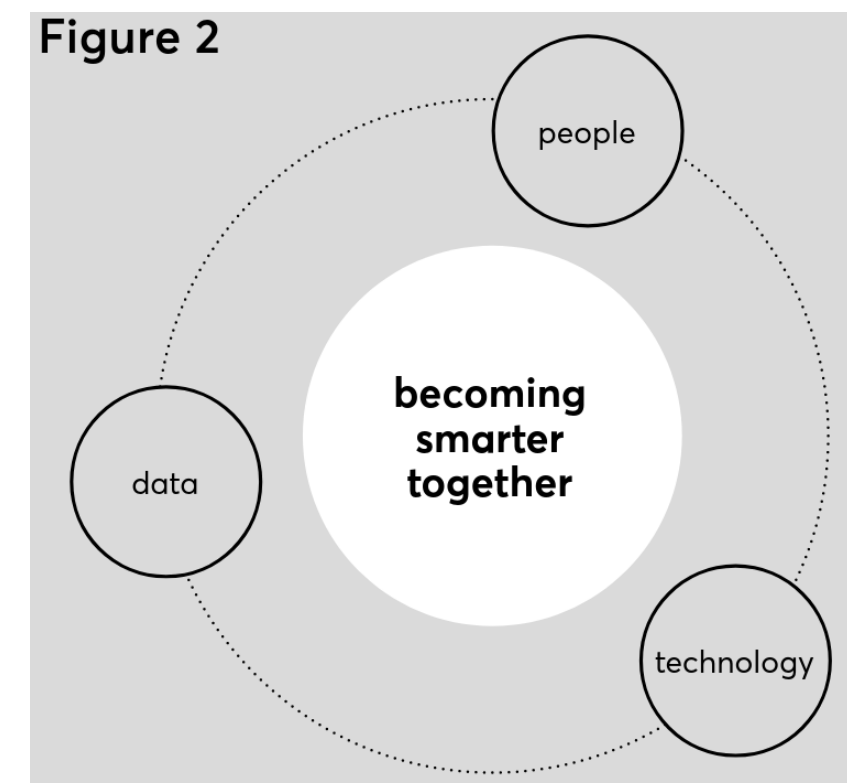Intelligenza collettiva e i cambiamenti in sanità

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What is collective intelligence?

At its simplest, 'collective intelligence' can be understood as the enhanced capacity that is created when people work together, often with the help of technology, to mobilise a wider range of information, ideas and insights. Collective intelligence (CI) emerges when these contributions are combined to become more than the sum of their parts for purposes ranging from learning and innovation to decision-making.

It has been around for a long time, but the rise of new technologies that connect more and more individuals over greater distances to share knowledge and skills has transformed what can be achieved through CI. In the 19th century, it took almost 70 years to crowdsource the 400,000 words that made up the complete first edition of the Oxford English Dictionary. A modern-day equivalent, Wikipedia, receives 1.8 edits per second and sees more than 6 million new pages created per month.

nesta
The future of minds and machines
How artificial intelligence can enhance collective intelligence
AUTHORS
Aleks Berditchevskaia
Peter Baeck

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What is collective intelligence?

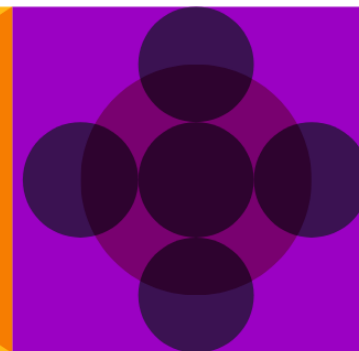Figure 2

What is collective intelligence?

understand problems

Generate contextualised insights, facts and information on the dynamics of a situation.

seek solutions

Find novel approaches or tested solutions from elsewhere. Or incentivise innovators to create new ways of tackling the problem.

Monitor the implementation of initiatives by involving citizens in generating data, and share knowledge to improve the ability of others.
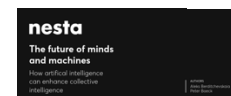
Make decisions with, or informed by, collaborative input from a wide range of people and/or relevant experts.
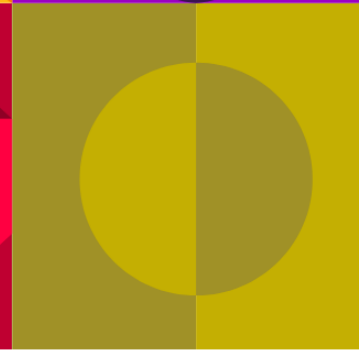
learn and adapt

decide and act

Connecting people with people

The oldest form of CI, bringing people together with other people. It can facilitate distributed information gathering, problem-solving, peer learning and prediction-making. Increasingly, this form of CI combines offline engagement with online contributions, which allows inputs from larger groups of contributors. Methods include peer production, participatory prioritisation, deliberation and open ideation.
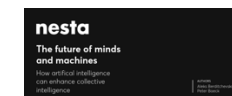
Connecting people with data

Brings both people and data together and often involves crowds generating, categorising or filtering unstructured data, such as photos or audio recordings. Some methods offer deeper engagement in processes beyond data gathering, to include participants in the scoping, analysis and evaluation phases of projects. Citizen science, crowdsourcing and crowdmapping are typical such methods.
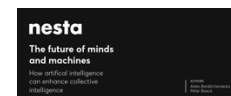
Connecting data with data

Brings together multiple and diverse datasets to help generate new and useful insights. These methods increasingly make use of non-conventional data sources generated by people, such as posts on social media, mobile phone geolocation and sensor data. Data collaboratives, open-source repositories and open application programming interfaces (APIs) are some of the methods that are typically used in these data-driven CI projects.

Optimal incentives for collective intelligence

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Edited by Simon A. Levin, Princeton University, Princeton, NJ, and approved April 4, 2017 (received for review November 11, 2016)

Collective intelligence is the ability of a group to perform more effectively than any individual alone.
Diversity among groupmembers is a key condition for the emergence of collective intel-ligence, but maintaining diversity is challenging in the face ofsocial pressure to imitate one's peers.

Through an evolutionarygame-theoretic model of collective prediction, we investigate therole that incentives may play in maintaining useful diversity.We show that market-based incentive systems produce herdingeffects, reduce information available to the group, and restraincollective intelligence. Therefore, we propose an incentive schemethat rewards accurate minority predictions and show that thisproduces optimal diversity and collective predictive accuracy. Weconclude that real world systems should reward those who haveshown accuracy when the majority opinion has been in error.

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Executive summary

As people live longer, but also with more long-term conditions, there is an inexorable increase in the demand for healthcare.

The workforce is also changing: millennials have new expectations and most people seek a good work-life balance through flexible careers. The NHS Long Term Plan identifies the need for more healthcare workers to respond to this increasing demand. Digital healthcare technologies, defined here as genomics, digital medicine, artificial intelligence (AI) and robotics, should not just be seen as increasing costs, but rather as a new means of addressing the big healthcare challenges of the 21st century.

The UK has the potential to become a world leader in these healthcare technologies and this Review anticipates how technological innovation will impact the roles and functions of healthcare staff over the next two decades. Our review of the evidence leads us to suggest that these technologies will not replace healthcare professionals, but will enhance them ('augment them'), giving them more time to care for patients. Some professions will be more affected than others, but the impact on patient outcomes should in all cases be positive. Patients will be empowered to participate more fully in their own care.

This ground-breaking Review has sought expert opinion from across the UK and overseas. This is the first time that such a wide breadth of expertise has been brought together to anticipate and debate the impact of technological innovation on the NHS workforce.

With patients placed firmly at the centre of our discussions, this report is the culmination of an extensive literature review, interviews, expert meetings and roundtables. We had an overwhelming response to the call for evidence from individuals and organisations, with responses from hundreds of patient representatives, professional groups, industry, education, regulators and national bodies.

Within 20 years, 90% of all jobs in the NHS will require some element of digital skills. Staff will need to be able to navigate a data-rich healthcare environment. All staff will need digital and genomics literacy. This Review is about both the existing and the future workforce. We need to tackle differences in the digital literacy of the current workforce linked to age or place of work.

The next decade presents an opportunity to address data governance and cyber security concerns, agree ethical frameworks and develop NHS staff/organisations to implement genomics and digital technologies in the workplace. The complexity of data governance requirements should not be a reason for inaction. Most importantly, there must be mechanisms in place to ensure advanced technology does not dehumanise care. While automation will improve efficiency, it should not replace human interaction.

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The Review Board recommends

The citizen and the patient

- In a similar way to other public health education initiatives, programmes aimed at engaging and educating the public about genomics and digital healthcare technologies should be developed. (P1)

- The NHS should work with patient and carer organisations to support appropriate patient education. (P2)

- Local arrangements should be established to provide needs-based targeted education and support through existing patient support provision, where possible. (HI1)

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The AI and Robotics PanelRecommends:

The citizen and the patient

- The NHS should ensure that patients are involved from the beginning in the design and implementation of AI software for healthcare, with their needs and preferences reflected in the co-design process. (AIR1)

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The AI and Robotics PanelRecommends:

<u>Healthcare professionals</u>

- Educational resources should be developed to educate and train all healthcare professionals in: health data provenance, curation, integration and governance; the ethics of AI and autonomous systems/tools; critical appraisal and interpretation of AI and robotics technologies. (AIR2)

**The AI and Robotics Panel
recommends:**

Health system

- The NHS should leverage its global reputation and integrated datasets to attract skilled experts from the global community of data scientists. (AIR3)

- Given the national shortage and competition for AI specialists, there should be a national programme of 'Industry Exchange Networks' that would benefit the NHS. (AIR4)

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6.1 The potential of AI and robotics technologies in healthcare

Healthcare is data intensive, combining not only huge volumes of disparate and complex sources of data, but also complex classifications and meanings.
Advances in mathematics, computing power, cloud computing and algorithm design have accelerated the development of methods that can be used to analyse, interpret and make predictions using these data sources. AI encompasses a multitude of technologies, including but not limited to analysing and discovering patterns in data.

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AI has the potential to transform the delivery of healthcare in the NHS, from streamlining workflow processes to improving the accuracy of diagnosis and personalising treatment, as well as helping staff work more efficiently and effectively.

With modern AI, a mix of human and artificial intelligences can be deployed across discipline boundaries to generate a greater collective intelligence

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==Artificial intelligence is a tool, and like any other healthcare tool, **NHS professionals must be trained to use it in the right manner and context with confidence**==. The fundamentals of AI and machine learning are based on digital data curation, statistics and probability, and it is these areas that the NHS staff of today will need to master in order to benefit from the tools of tomorrow."

Dr Hugh Harvey

About the Topol Digital Fellowship programme

The Topol Programme for Digital Fellowships in Healthcare aims to support NHS organisations to invest in clinical staff to develop specialist digital skills and to learn about leading digital transformation, while giving clinicians enough time outside of clinical commitments to lead digital health improvements and innovations.

The fellowship programme will provide fellows with time and support to design and deliver digital health projects and initiatives in their organisations and a programme of workshops and mentoring to stimulate and support fellows to lead digital health transformations for NHS staff and patients. This will be an exciting opportunity for NHS clinical staff, including doctors, nurses, allied health professionals, dentists, healthcare scientists, pharmacists and others, to shape and accelerate the NHS digital revolution.

The first cohort of digital fellows began their fellowships in September 2019.

Cohort 1 →

Find out about our first cohort of TOPOL digital fellows.

Find out more

Cohort 2 →

Find out how to apply for the second cohort.

Find out more

Passi d'argento 2022-23:
I dati su fragilità, problemi sensoriali e uso dei farmaci negli anziani

Dalle interviste emerge che circa **17 persone su 100 sono fragili, condizione associata allo svantaggio socio-economico**, **sale al 25% fra le persone con molte difficoltà econom**iche (vs 14% tra chi non ne riferisce) e **cresce progressivamente con l'età, interessando il 9% dei 65-74enni e il 33% degli ultra 85enni. La condizione di disabilità coinvolge 14 persone su 100 e anch'essa è mediamente più frequente fra le persone socio-economicamente svantaggiate per difficoltà economiche (29% fra chi ha molte difficoltà economiche vs 8% tra chi non ne riferisce) e fra le donne (17% vs 10% uomini**).

Inoltre, **una persona su 4 ha almeno un problema di tipo sensoriale (fra vista, udito o masticazione) che non risolve neppure con il ricorso ad ausili**, come occhiali, apparecchio acustico o dentiera. In particolare, nel biennio considerato, **circa il 9% degli intervistati ultra 65enni riferisce di avere problemi di vista, il 15% un problema di udito e il 13% problemi di masticazione.**

https://www.epicentro.iss.it/passi-argento/

Questo aumento della longevità non si traduce in un miglioramento proporzionale della qualità degli anni di vita o di salute, né per le donne né per gli uomini anziani. Le conseguenze sono evidenti: il nostro sistema sanitario deve affrontare sfide economiche e sociali di crescente **complessità**.

Ma che cosa significa complessità?

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Stefanie Nicolaus[1], Baptiste Crelier[2], Jacques D Donzé[3,4,5] and Carole E Aubert[2,6,7,8]

Abstract

Background: Better identification of complex patients could help to improve their care. However, **the definition of patient complexity itself is far from obvious**. We conducted a narrative review to identify, describe, and synthesize the definitions of patient complexity used in the last 25 years.

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Results: Among 83 articles, there was marked heterogeneity in the patient complexity definitions. ==Domains contributing to complexity included health, demographics, behavior, socio-economic factors, healthcare system, medical decision-making, and environment. Patient complexity was defined according to medical aspects in 30 (36.1%) articles, and to medical and/or non-medical aspects in 53 (63.9%) articles. A tool was used in 36 (43.4%) articles, and a conceptual model in seven (8.4%) articles.==

Conclusion: ==A consensus concerning the definition of patient complexity was lacking. Most definitions incorporated non-medical factors in the definition, underlining the importance of accounting not only for medical but also for non-medical aspects, as well as for their interrelationship.==

Journal of Multimorbidity and Comorbidity 2022; 12: 1–13

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Discussion

To our knowledge, th**is is the first review to provide a detailed description of the definitions of patient complexity used in the last 25 years. The definitions among the 83 articles included were extremely heterogeneous**. **Some authors limited the assessment to <mark>medical</mark> factors**, (most often a number of conditions), while **others expanded their definition to <mark>non-medical aspects</mark>.** A **substantial number of articles used a tool** (e.g., index and algorithm) **or a conceptual model** to describe patient complexity. Few studies were designed to explicitly investigate or define patient complexity, and most articles referred to the outpatient setting.
This review revealed several important findings.

First, several articles used the terms multimorbidity, polymorbidity, or comorbidity interchangeably with complexity, or limited the definition of complexity to a number of medical conditions. However, there was a notable **lack of consensus on the number and type of conditions to include.**.

Second, **almost two-thirds of the articles included non medical aspects to define patient complexity**. **Central aspects of the high degree of patient individuality, the dynamic of complexity, and the interrelation between different domains definitions were the, such as interactions of diagnostic procedures or interventions, various treatment strategies, multiple healthcare providers, or chronic conditions with positive or negative mutual influence.**

Journal of Multimorbidity and Comorbidity 2022; 12: 1–13

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Third, we identified several tools that included **medical and non-medical aspects** to assess complexity, which is a more systematic way to improve comparability across studies. The INTERMED is probably the best studied validated and reliable tool for this purpose. The MTM Spider Web is another interesting instrument, showing that **patient complexity is also a challenge for pharmacists, and that medication regimen should not be neglected when assessing complexity.**

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Fourth, we identified several domains that can increase complexity, but that may be difficult to assess in a standardized way or in clinical routine. These included **educational status, cognitive or functional decline, missed appointments, abuse, mental disorders, lack of coping strategies, patient preferences diverging from those of providers, or reduced adherence**. According to Zullig et al., considering patient preferences would be particularly important, but is **frequently missing** in the evaluation of patient

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Furthermore, **the potential effect of relatives on an individual's capacity to manage their health was rarely part of the definitions**. Moreover, it is worth mentioning that literature on patient complexity identified in this review mostly comes from high-income countries, while the topic seems to remain underexplored in low- or middle-income the countries. **It would be interesting to study which aspects of complexity are similar or differ between low-, middle-, and high-income countries**. **Finally, the concept of frailty, which has several validated**
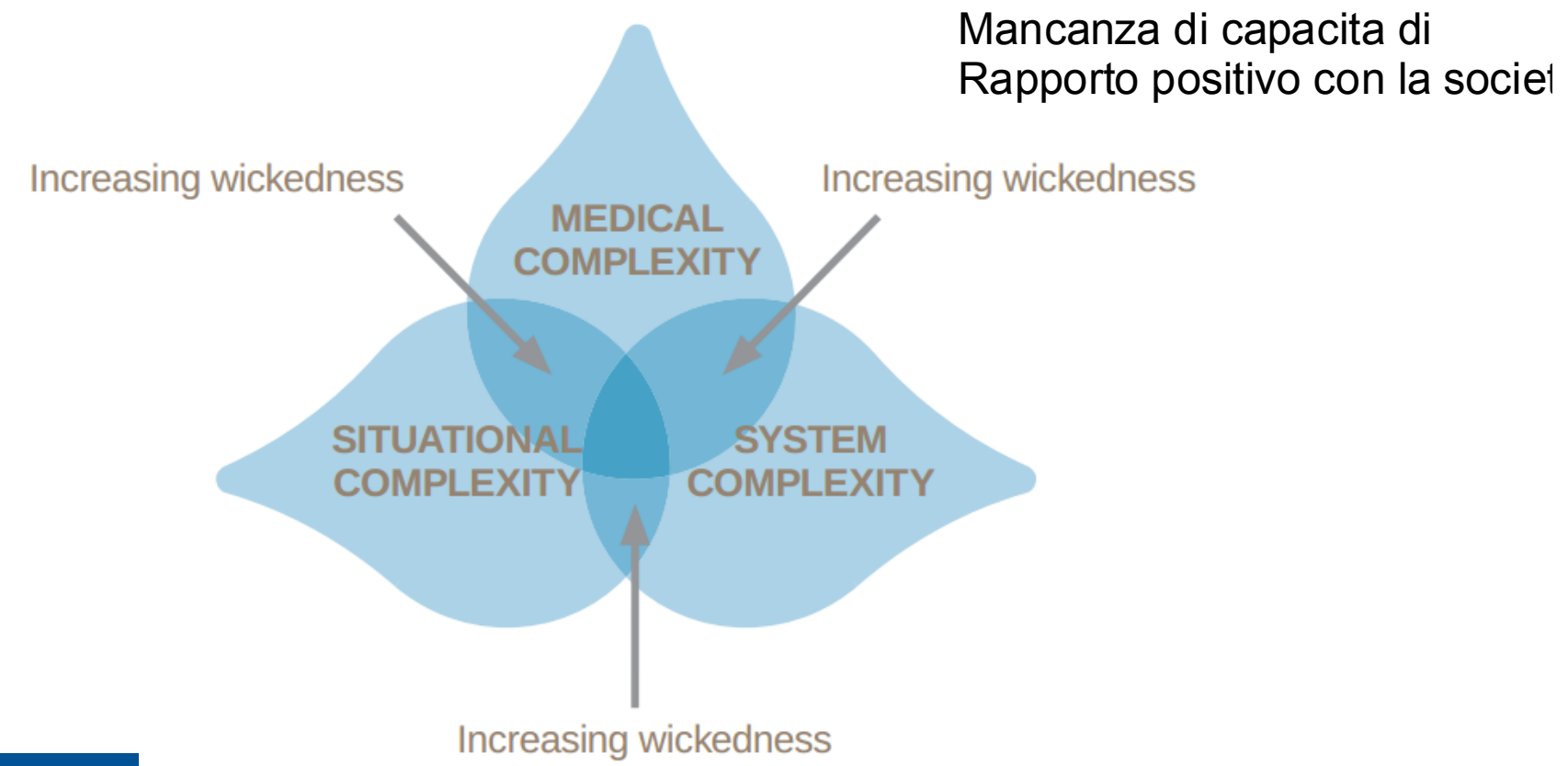
Conclusion

In summary, **this review found that patient complexity was extremely heterogeneously defined across the publications.**

A standard definon for a concept so frequently used in the medical literature is lacking. Patient complexity definition was frequently based on chronic conditions only, although non-medical aspects and interrelationships between various medical and non-medical domains seem to play a key role in patient complexity. A holistic approach including biopsychological, cultural, socio-economic, and environmental factors, as well as patient perspectives, seems therefore the most appropriate.

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Dimensions of health care complexity and 'wickedness'

Mancanza di capacita di
Rapporto positivo con la societ

Increasing wickedness

MEDICAL COMPLEXITY

Increasing wickedness

SITUATIONAL COMPLEXITY

SYSTEM COMPLEXITY

Increasing wickedness

ClinEdQ
Clinical Education and Training Queensland

Complexity and health care:
health practitioner workforce services, roles, skills and traini
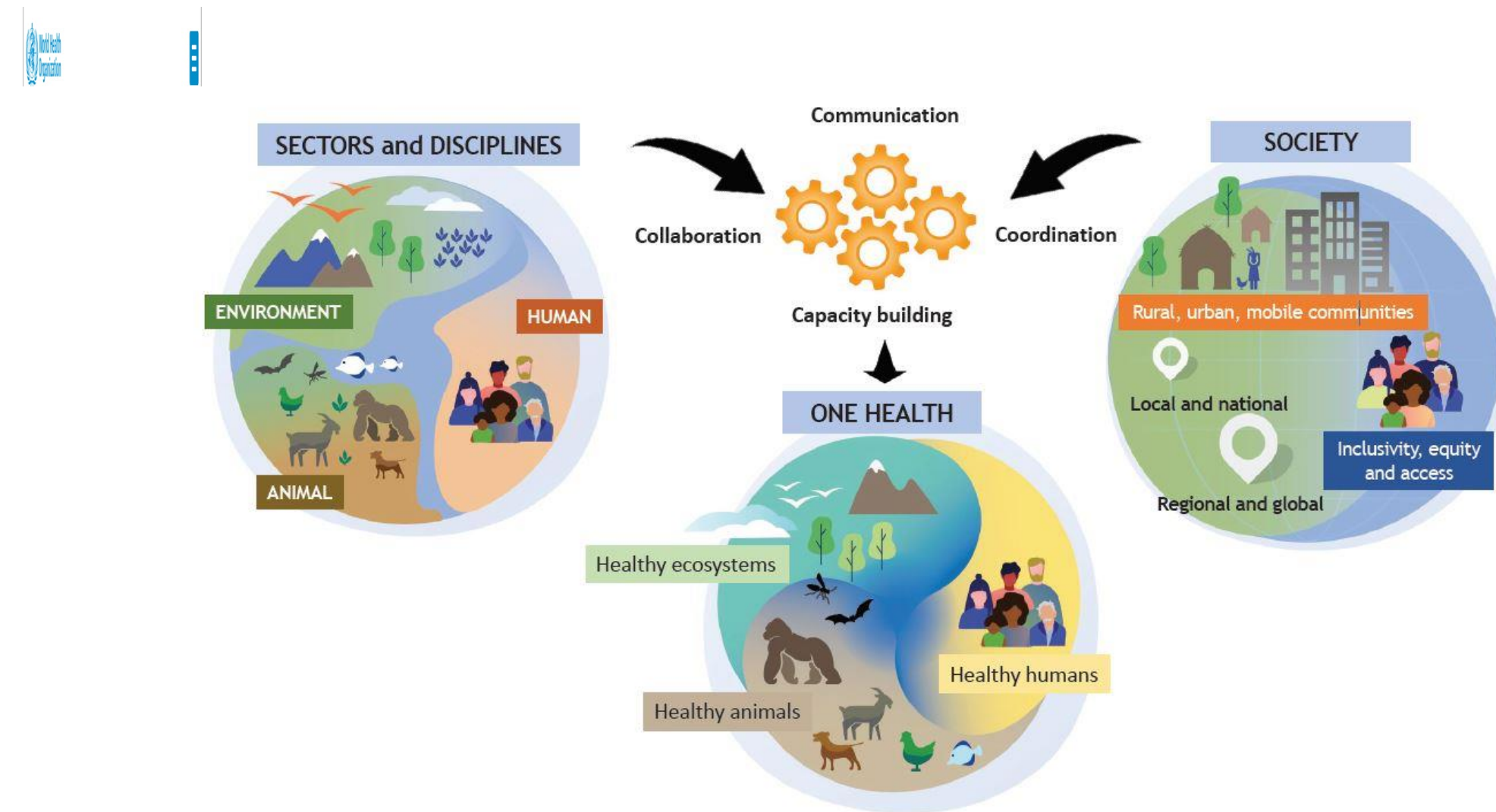to respond to patients with complex needs

Queensland 2011

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One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development. [48]

https://www.who.int/news/item/01-12-2021-tripartite-and-unep-support-ohhlep-s-definition-of-one-health

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

What is One Health?

One Health is <mark>an approach that recognizes that the health of people is closely connected to the health of animals and our shared environment. One Health is not new, but it</mark> has become more important in recent years. This is because many factors have changed interactions between people, animals, plants, and our environment.

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Istituto Superiore di Sanità

La visione olistica One Health, **ossia un modello sanitario basato sull'integrazione di discipline diverse**, è antica e al contempo attuale. Si basa sul riconoscimento che la salute umana, la salute animale e la salute dell'ecosistema siano legate indissolubilmente.

È riconosciuta ufficialmente dal Ministero della Salute italiano, dalla Commissione Europea e da tutte le organizzazioni internazionali quale strategia rilevante in tutti i settori che beneficiano della collaborazione tra diverse discipline (medici, veterinari, ambientalisti, economisti, sociologi etc.).

La **One Health è un approccio ideale per raggiungere la salute globale perché affronta i bisogni delle popolazioni più vulnerabili sulla base dell'intima relazione tra la loro salute, la salute dei loro animali e l'ambiente in cui vivono, considerando l'ampio spettro di determinanti che da questa relazione emerge**. 51

Impact of Artificial Intelligence (AI) Technology in Healthcare Sector: A Critical Evaluation of Both Sides of the Coin

Md. Ashrafur Rahman[1], Evangelos Victoros[1], Julianne Ernest[1], Rob Davis[1], Yeasna Shanjana[2] and Md. Rabiul Islam[3]

[1]Nesbitt School of Pharmacy Wilkes University, Wilkes-Barre, PA, USA. [2]Department of Environmental Sciences, North South University, Bashundhara, Dhaka, Bangladesh. [3]School of Pharmacy, BRAC University, Dhaka, Bangladesh.

ABSTRACT: The influence of artificial intelligence (AI) has drastically risen in recent years, especially in the field of medicine. ==Its influence has spread so greatly that it is determined to become a pillar in the future medical world.== AI excels in aspects such as rapid adaptation, high diagnostic accuracy, and data management that can help improve workforce productivity

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According to the present observation and available evidence, ==AI has some impact on healthcare settings==. Assisting physicians in accurate, quick diagnosis and developing effective treatment plans, expediting patient waiting time, reducing redundant paperwork for nurses, and ensuring the regulatory requirements can be examples of the use of AI in healthcare.

Besides the benefits of AI in the medical sector, the negative consequences need to be judged well for use in the workforce. Resolving ==data accessibility, maintaining data privacy, ensuring the authenticity of ChatGPT,== maintaining accountability, and proper training of the health associates are the parameters to overcome the negative aspects of AI.

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ZADIG

Chi siamo   Le nostre idee   I nostri servizi   Multimedia   Ebook

HOME
MEDIATECA

Etica e Intelligenza artificiale per la salute: le linee guida dell'OMS

Zadig pubblica, in collaborazione con la Società Italiana di Intelligenza Artificiale in Medicina (SIIAM), l'edizione italiana delle Linee guida OMS su etica e governance dell'intelligenza artificiale per la salute. Un impegno verso un'innovazione tecnologica che sia al servizio della salute e del benessere di tutti, con particolare riguardo alle fasce più deboli della società.

7 Giu. 2024
di **Silvia Emendi**   NOTIZIA   SCIENZA   SALUTE   DIRITTI

SIIAM   ZADIG

Etica e governance
dell'intelligenza artificiale
per la salute

Linee guida per i modelli multimodali
di grandi dimensioni (LMM)

Tuttavia, è fondamentale sottolineare che l'uso degli LMM dovrebbe essere visto come un supporto e non come una sostituzione alla comunicazione diretta tra medico e paziente, l'uso degli LMM nell'ambito del consenso informato deve essere sottoposto a un'attenta supervisione da parte dei medici, che rimangono responsabili di garantire che i pazienti ricevano informazioni accurate, complete e comprensibili, ed eventuali errori o imprecisioni generate dagli LMM potrebbero avere conseguenze legali per i medici. [55]

On June 23, 2008, **Chris Anderson** posted an article on **Wired's** website, "The **end of theory**: the data deluge makes the scientific method obsolete,"

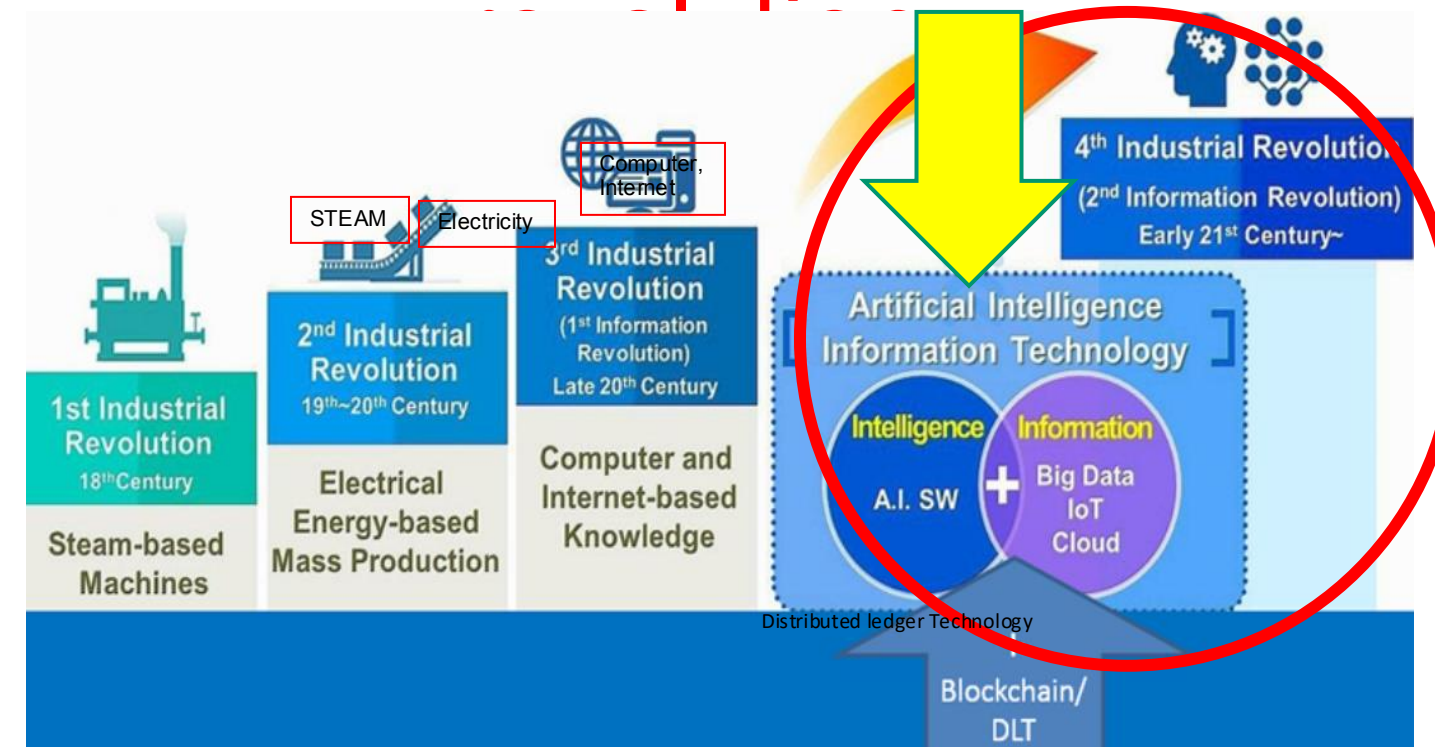The MIT Press: Cambridge.Anderson, C. (2008). The End of Theory: The Data Deluge Makes the Scientific Method Obsolete. Wired Magazine June 23, 2008. Retrieved from: https://www.wired.com/2008/06/pb-theory/ Bogen, J., & Woodward, J. (1988).

La **quarta** rivoluzione industriale
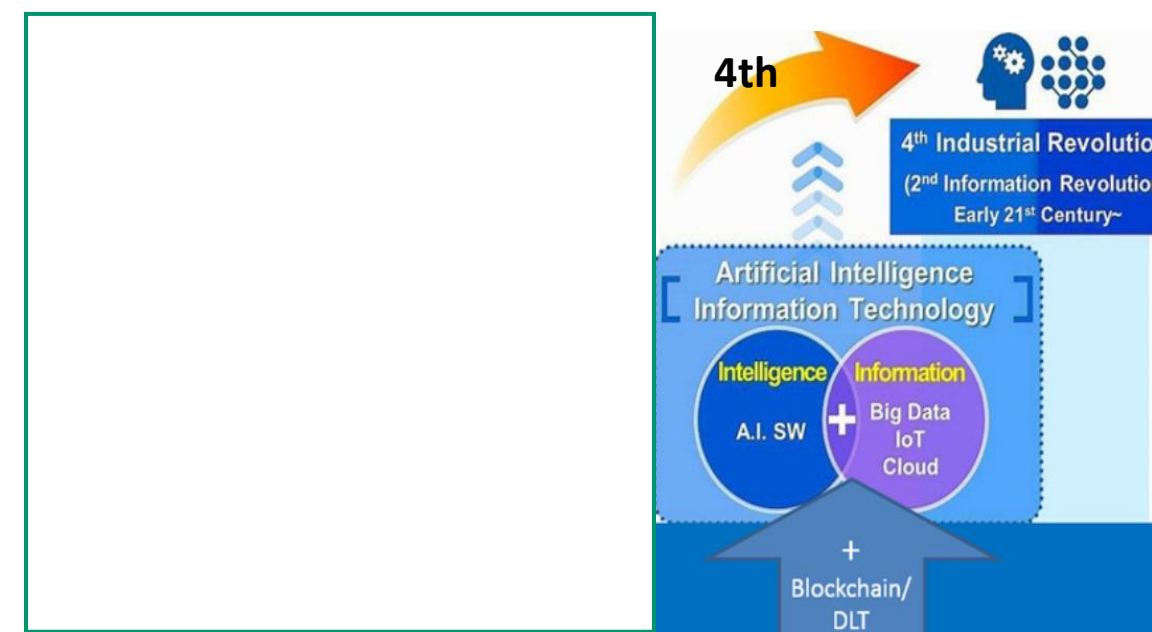
The **fourth** industrial
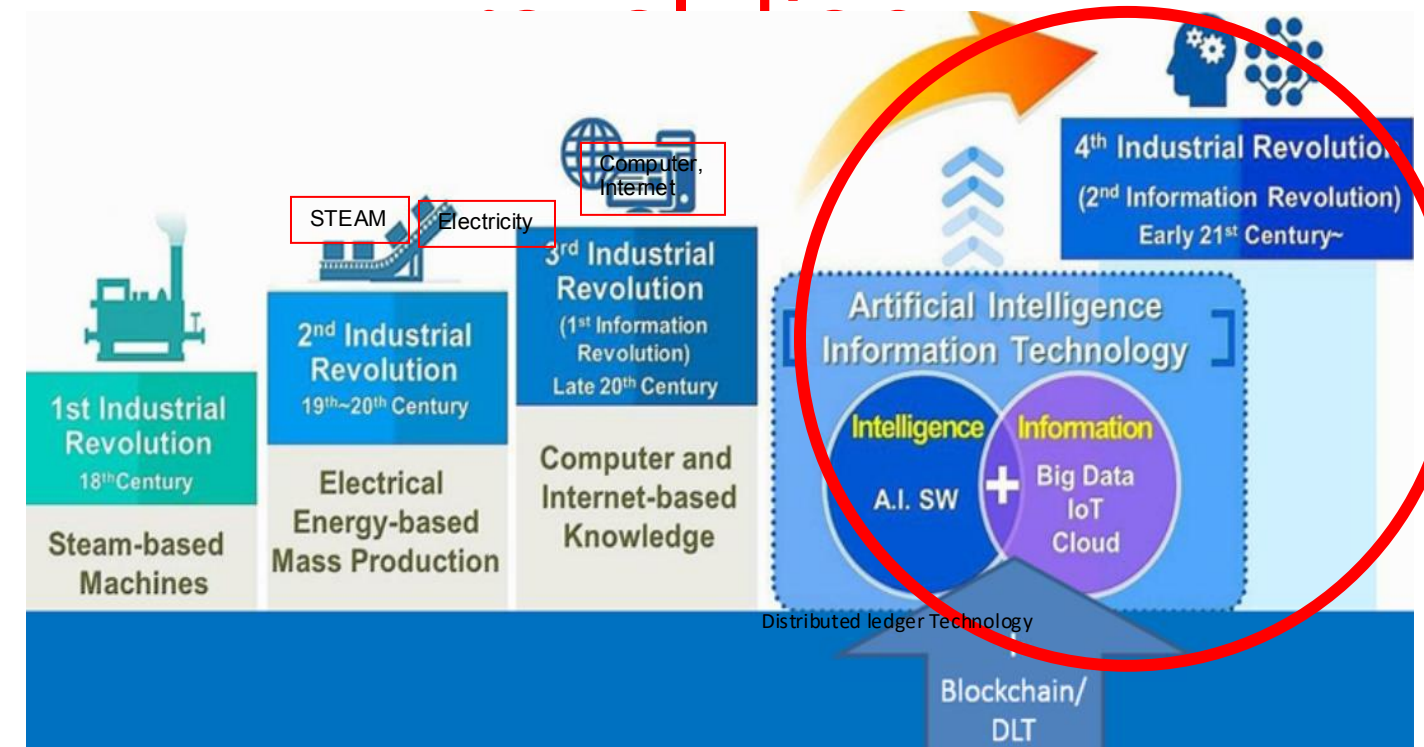
The fourth industrial revolution

PASSATO

PRESENTE

FUTURO

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IL PASSATO DELLA MEDICINA

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Il medico nel mondo antico

Nel mondo antico una valutazione soggettiva del medico, ampiamente condivisa, cercava nel professionista doti come:

- Amor
- Suavitas
- Humanitas

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NOTE STORICHE

Nel 1742, Antonio Cocchi presenta al Conte di Richecourt, in qualità di Consigliere di Stato e di Reggenza, una Relazione sullo Spedale di Santa Maria Nuova di Firenze, allo scopo di

...*"conservazione ed aumento delle facoltà dello spedale e più che sia possibile completa ed efficace esecuzione delle sue opere"*...

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La metodologia usata da Cocchi si basa su **_osservazione e informazione_**, in modo da poter **inquadrare** lo **stato dell'ospedale e valutare gli interventi necessari**.

A. Cocchi, 1742

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il medico dovrà sempre più saper interagire con dati complessi e interpretare le analisi fornite dagli strumenti di IA.
A tal fine, sarà necessario ripensare i programmi formativi delle scuole di medicina e dei corsi di specializzazione.
In un contesto dove l'IA e le tecnologie avanzate hanno un impatto sempre maggiore, la sfida diventa duplice: da un lato, formare professionisti capaci di padroneggiare le nuove tecnologie; dall'altro, preservare quelle competenze umane che nessun algoritmo potrà mai replicare

Le sinergie virtuose: organizzazione competenze tecnologie

Organizzazione

Competenze

Tecnologie

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