Intellectual Output 1.1

Review of the Literature

IENE 10

Preparing health and social care workers to work with socially assistive artificially intelligent robots in health and social care environments

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Contents

1. Introduction

This template is part of the Intellectual Output 1 (IO1) of the Project "IENE10- Preparing health and social care workers to work with socially assistive artificially intelligent robots in health and social care environments".

The overall goal of the project is to produce a European Transcultural Robotic Nursing (TRN) Curriculum model and learning materials and the creation of a TRN-MOOC course (massive open access online course), which will be suitable for health and social care workers and educators.
IO1 aims to identify the need, challenges and advantages of Transcultural Robotics Nursing (TRN) and to develop a Transcultural Robotics Nursing (TRN) Curriculum Model.

This output forms the bases in producing learning materials suitable for social and health professionals and educators that will be used in the MOOC course on TNR. This will enable the development of the MOOC that will combines IENEs main principles and products with socially assistive robotics and artificial intelligence in health and social care.

The leading partner of this output (CUT) reported recent European and international publications and other reports on TRN related issues particularly those related to training of the workforce. All partners reported the existence of and obtain similar reports from their countries. In this report 25 international/European and 124 national (Cyprus, Austria, Italy, Romania, UK) publications/sources are presented.

2. Type of Information/Sources and Format

Type of Information:
The information related to the Output 1 covers relevant literature on views, attitudes and/or needs of nurses/health/social care professionals on Transcultural Robotics Nursing/robotics/robots, through the following sources:

a) Peer reviewed articles
b) Grey literature/reports

The literature/information in the categories above is at three levels: International, European and national level.

a) Peer reviewed articles

Sources:

a) EBSCO (CINAHL, MEDLINE, PubMed) b) Google scholar c) Cochrane d) PsycINFO e) ScienceDirect f) Embase g) Web of Science h) IEEE Xplore digital library and any other identified by partners as relevant.

International and European sources searched by CY. National (local) sources obtained by each partner (AT, CY, IT, RO, UK).

***Each partner** selected articles published in peer-reviewed journals in their native language in the fields of Social Sciences, Health and Behavioural Sciences, Information Technology, Artificial Intelligence and Robotics, on the topic of interest which is training health and social care workers to be able to work with Artificial Intelligent robots in their work environment. The scientific journals are*

*indexed in international electronic databases. Only articles published between **2018 - January 2021** searched for.*

Search terms:

Attitudes/needs/views of Nurses/health/social professionals/workers and TRN/robots/robotics

Format:

The whole article/report/ is provided in the form of a literature and a URL link; copyrights allowing, the pdf of the document/s, can also be provided.

b) Grey literature

"Grey literature stands for manifold document types produced on all levels of government, academics, business and industry in print and electronic formats that are protected by intellectual property rights, of sufficient quality to be collected and preserved by libraries and institutional repositories, but not controlled by commercial publishers; i.e. where publishing is not the primary activity of the producing body."

Sources:

a) International and European: Government reports, policy statements/papers, theses, project/white papers and evaluations, conference proceedings/ bulletins/fact sheets.
b) National: Government reports, policy statements/papers, theses, project/white papers and evaluations, conference proceedings/ bulletins/fact sheets.

International and European sources searched by CY. National (local) sources obtained by each partner (AT, CY, IT, RO, UK). *Grey literature searched between **2010 - January 2021.***

Format:

The literature identified includes a summary in English. Links to the website/upload files- pdf document/s are provided.

3. International/European Peer Review and Grey Literature

In 21st century advances in intelligent technology brought many positive changes in health and social care. One of these technologies is the usage of robots in health and social care primarily of the elderly. Overall, health and social care workers reported mixed views regarding the use of robots in a healthcare setting.

Most of them viewed social robots as beneficial and practical in psychosocial care for older adults (Chuan, Cindy and Wend, 2020; Rantanen , Lehto, Vuorinen and Coco, 2018). Further, recent literature showed that robots are able to increase productivity and also being considered as good devices for activating the patients' motoric and cognitive skills (Łukasik, Tobis, Kropińska and Suwalska, 2020; Chuan, Cindy and Wend, 2020; Vänni, Sirpa and Salin, 2019). Further, health professionals seem to have positive attitudes towards the use of social robots when used for older adults (Chuan, Cindy and Wend, 2020).

According to Papadopoulos et al. (2019), several barriers for the implementation of socially assistive humanoid robots in health and social care, seem to be related to the technical problems, previous experience with technology, robots' limited capabilities and negative preconceptions towards the use of robots in healthcare. Some studies highlighted the importance of setting social and legal boundaries for robots in order to ensure safety and privacy of the caregivers and patients (Papadopoulos et al., 2020; Vänni et al., 2019; Coco, Kangasniemi and Rantanen, 2018; Maalouf, Sidaoui, Elhajj and Asmar, 2018).

According to grey literature, in Japan human-like robots are already being utilized as supplemental healthcare workers in elders' homes across the country. Larger robotic machines can be used to carry-out laborious physical tasks like moving patients and smaller interactive robots are being used to combat loneliness and inactivity in the elderly population (Hamstra, 2018). The attitudes of health professionals towards the use of social robots for older adults in long-term care were significantly influenced by their awareness for social robots (Schutte, 2019).

The European Commission (2020), states that artificial intelligence is a strategic technology that offers many benefits to citizens, businesses and societies, provided that it is human-centred, ethical and sustainable and respects fundamental rights and values.

Robots that can respond to elderly and patients' needs in a sensitive and culturally appropriate way are more likely to be trusted and accepted by caregivers (Research Centre for Transcultural Studies in Health, nd). This is of global importance as ageing populations across the world demand more health and social care resources. Culturally competent robots can relieve the pressures on caregivers in hospitals and care homes (Research Centre for Transcultural Studies in Health, nd).

Possible disadvantages to the implementation of humanoid robots in health and social care include the ability for intelligent online hackers to infiltrate the healthcare databases and gain access to sensitive private information. Another possible drawback of robotic nursing aid is the lack of 'human touch' (Hamstra, 2018).

However, further evidence is needed around socially assistive robots in relation to health and social care provision.

INTERNATIONAL and EUROPEAN

PEER REVIEWED ARTICLES

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of Nurse/Health professionals to work with socially assistive artificially intelligent robots in health and social care environments. Short descriptions of each article are provided as are links and/or PDF files.
Years: 2018-1/2021

	Summary	Reference/Link
1	The use of socially assistive robots in pre-tertiary education is promising, but studies focussing on mathematics and science are significantly under-represented. Further evidence is also required around socially assistive robots' specific contributions to learning more broadly, as well as enabling/impeding factors, such as SAR's personalisation and appearance, or the role of families and ethical considerations.	Papadopoulos, I., Lazzarino, R., Miah, S. Weaver, T., Thomas, B., Koulouglioti, C. (2020) A systematic review of the literature regarding socially assistive robots in pre-tertiary education. *Computers & Education*. 155, 103924. https://www.researchgate.net/publication/341502722_A_systematic_review_of_socially_assistive_robots_in_pre-tertiary_education
2	The participants of this study believed that assistive robots should, first of all, remind older people to take medication regularly, ensure their safety, monitor their health status and environment, provide cognitive training, and encourage them to maintain physical activity. In the students' opinion, the robot should not be an older person's companion but only act as an assistant. Nursing students had significantly higher scores than medical students in several statements concerning everyday use of robots, including reminding about meals (P=.03), monitoring the environment (P=.001), providing advice about a healthy diet (P=.04), monitoring the intake of food and fluids (P=.02), and automatic "switch on" function (P=.02). Nursing students were more focused on the social functions of robots, including encouraging contact with friends (P=.003) and reducing the sense of loneliness and improving mood (P=.008). Medical students were more aware of privacy issues in the statement concerning the possibility of switching off the robot in specific situations (P=.01).	Łukasik, S., Tobis, S., Kropińska, S., Suwalska, A. (2020) Role of Assistive Robots in the Care of Older People: Survey Study Among Medical and Nursing Students. *J Med Internet Res.* 22 (8), e18003. https://www.jmir.org/2020/8/e18003/
3	Most health personnel had positive attitudes towards the use of social robot in long-term care facilities as they viewed social robots as beneficial and practical in psychosocial care for	Chuan, C., Cindy, J., Wend, M. (2020) Health Professional and Workers Attitudes Towards the Use of Social Robots

	older adults. Positive attitudes towards the use of social robot can increase acceptance and utilisation of social robots. This study strives to support nursing work by providing insights into health personnel's perceptions of social robots, in order to integrate social robots into the care and lives of older adults.	for Older Adults in Long-Term Care. *International Journal of Social Robotics*. 12, 1135–1147. https://pure.bond.edu.au/ws/files/34797821/AM_Health_Professional_and_Workers_Attitudes_Towards_the_Use_of_Social.pdf
4	The enablers found were enjoyment, usability, personalisation and familiarisation. Barriers previous experience with technology and views of formal and informal carers were related to technical problems, to the robots' limited capabilities and the negative preconceptions towards the use of robots in healthcare. Factors which produced mixed results were the robot's human-like attributes, to the robots' limited capabilities and the negative preconceptions towards the use of robots in healthcare.	Papadopoulos, I., Koulouglioti, C., Lazzarino, R., Ali, S. (2019) Enablers and barriers to the implementation of socially assistive humanoid robots in health and social care: a systematic review. *BMJ Open*. 10 (1). http://dx.doi.org/10.1136/bmjopen-2019-033096
5	The results show that public opinion is mainly negative, but that the commentators apparently have little information about the robot and its tasks. The personnel had more positive views; they saw it as a recreational tool, not as a replacement for their own roles.	Tuisku, O., Pekkarinen, S., Hennala , L. and Melkas, H. (2019) "Robots do not replace a nurse with a beating heart" The publicity around a robotic innovation in elderly care. *Information Technology & People*. 32 (1), 47-67. www.emeraldinsight.com/0959-3845.htm
6	Robots' application may ameliorate the overall quality of pediatric care, allowing for better apportioning of nurses' time and energies to focus on direct patient care and reducing nurses' workloads. However, some possible disadvantages need attention, including robots' inability to provide genuine human touch, demonstrate human emotions associated with pediatric care, and exhibit cultural sensitivity. It is desirable to embed nursing practice needs in the advanced functions of robots and thereby ensure safe, reliable robotics suitable for pediatric care usage.	Liang, H., Wu, K., Weng, C., Hsieh, H. (2019) Nurses' Views on the Potential Use of Robots in the Pediatric Unit. *Journal of Pediatric Nursing.* 47, 58–64. https://europepmc.org/article/med/31076190
7	Both professional care workers and healthcare educators perceived that robots were able to increase productivity. The results also showed that robots can reduce the mental workload of workers and to increase the diversity of work. Robots were also considered as good devices for activating the patients' motoric and cognitive skills and for making them happy. Even if the attitudes were positive and people were not afraid that robots may take over workplaces, the ecosystem of social robotics is still fragmented and the number of	Vänni, J.K., Sirpa E. and Salin, E.S. (2019) Attitudes of Professionals Toward the Need for Assistive and Social Robots in the Healthcare Sector. In: Korn, O. (eds.) *Social Robots: Technological, Societal and Ethical Aspects of Human-Robot Interaction*, Springer, pp. 205-236.

	intervention studies among professional care workers is small.	https://link.springer.com/chapter/10.1007/978-3-030-17107-0_11
8	This integrative review aimed to explore the influence of culture on attitudes towards humanoid and animal-like robots. The study found that culture seems to influence attitudes and behaviour towards robots, as well as preference about the robot's appearance, expression of emotion, and communication style.	Papadopoulos, I. and Koulouglioti, C. (2018) The influence of culture on attitudes towards humanoid and animal like robots: an integrative review. *Journal of Nursing Scholarship.* 50 (6), 653-665. https://sigmapubs.onlinelibrary.wiley.com/doi/abs/10.1111/jnu.12422
9	This study was a scoping review of the literature exploring the views of nurses and other health and social care workers in relation to the use of assistive humanoid and animal-like robots in health and social care. The study found that there were mixed views about the use of robots, with some positive attitudes, but also some concerns (e.g. about privacy and patient safety). Healthcare professionals had considered the impact of the robot on the workplace and had identified some possible tasks that the robot could do.	Papadopoulos, I., Koulouglioti, C., and Ali, S. (2018) Views of nurses and other health and social care workers on the use of assistive humanoid and animal-like robots in health and social care: a scoping review. *Contemporary Nurse.* 54 (4-5), 425-442. https://pubmed.ncbi.nlm.nih.gov/30200824/
10	The field of robotics in nursing is evolving fast to cope with the need for help in caregiving, especially for the elderly and individuals with disabilities. This survey categorized robotic applications in nursing into assistive and social assistive robots, while focusing on the needs and weaknesses of robotics in each track. The survey highlights the importance of setting clear social and legal boundaries for robot–human relationships in order to help maintain the safety and privacy of the caregivers and patients.	Maalouf, N., Sidaoui, A., Elhajj, H.I. and Asmar, D. (2018) Robotics in Nursing: A Scoping Review. *Journal of Nursing Scholarship.* 50 (6), 590–600. https://sigmapubs.onlinelibrary.wiley.com/doi/full/10.1111/jnu.12424
11	Personnel behavioural intentions related to the introduction of robot applications in home care are influenced by their personal appreciation of the usefulness of robots, the expectations of their colleagues and supervisors, as well as by their own perceptions of their capacity to learn to use care robots. Personnel emphasised the value of care robots in providing reminders and guidance, as well as promoting the safety of the older people.	Rantanen , T., Lehto, P., Vuorinen , P., Coco, K (2018) The adoption of care robots in home care-A survey on the attitudes of Finnish home care personnel. *J Clin Nurs.* 27 (9-10), 1846-1859. https://pubmed.ncbi.nlm.nih.gov/29575204/
12	As fundamental to nursing practice grounded in the theory of Technological Competency as Caring in Nursing, the ultimate purpose of technological competency as caring in nursing is to know persons as caring who are participants in their care, rather than simply objects of care. The process of 'knowing persons as caring' in nursing is communicated as technological	Locsin, C.R. and Hirokazu Ito, H. (2018) Can humanoid nurse robots replace human nurses? *Journal of Nursing* 5(1). Doi: 10.7243/2056-9157-5-1

	knowing, mutual designing and participative engaging.	http://www.hoajonline.com/journals/pdf/2056-9157-5-1.pdf
13	Healthcare professionals had less experience with robots and more negative attitudes towards them than the general population. However, in healthcare, robot assistance was welcomed for certain tasks. These regarded, for example, heavy lifting and logistics. Previous experiences with robots were consistently correlated with robot acceptance.	Turja, T., Aerschot, V.L., Särkikoski, T., Oksanen, A. (2018) Finnish healthcare professionals' attitudes towards robots: Reflections on a population sample. *NursingOpen.* 5(3): 300-309. https://onlinelibrary.wiley.com/doi/full/10.1002/nop2.138
14	The data from the Japanese care personnel bring new perspectives to the concept of a close human–robot relationship. The differences seen in the results between Finland and Japan can be partly explained by cultural dissimilarity, but it is also known that Japan is a more developed country with regard to the use of robotics in nursing care. The research highlights the importance of cultural factors when examining the issue of care robotics. The factors affecting fear are a concern that care robots would be used to replace people, the dehumanization of treatment, and an increased loneliness in the elderly. Thus, further research is required to demonstrate the relationship between different cultural factors, and attitudes and conceptions toward care robots.	Coco, K., Kangasniemi, M. and Rantanen,T. (2018) Care Personnel's Attitudes and Fears Toward Care Robots in Elderly Care: A Comparison of Data from the Care Personnel in Finland and Japan. *J Nurs Scholarsh*. 50 (6), 634-644. https://sigmapubs.onlinelibrary.wiley.com/doi/abs/10.1111/jnu.12435
15	This article highlights some challenges of using social robotics and gives some guidance about the types of pedagogical approach that could be used in training. This might include: Exploring ideas and feelings about social robotics, engaging with the key philosophical, political and ethical issues, developing practical skills to work with robots (including development and programming), enquiring into the impact that social robotics may have on vulnerable service users.	Share, P. & Pender, J. (2018). Preparing for a Robot Future? Social Professions, social robotics and the challenges ahead. *Irish Journal of Applied Social Studies*. 18 (1). https://core.ac.uk/download/pdf/301314203.pdf
16	This was a descriptive qualitative study exploring the views and experiences of users of the social robot MARIO in various social care settings in the UK, Italy and Ireland. Semi-structured interviews were conducted with people with dementia, carers and relatives, formal carers and managers. Attitudes to the robot were mostly positive, and many benefits of the robot were highlighted. Some carers were sceptical at first but changed their mind after seeing the robot in action. Some concerns were also highlighted, for example, some carers and relatives believed that robots should not replace human interaction and care, and also that robots may not have the same capacity to provide carer as a human carer.	Casey, D., Barrett, E., Kovacic, T., Sancarlo, D., Ricciardi, F., Murphy, K., Koumpis, A., Santorelli, A., Gallagher, N & Whelan, S. (2020). The perceptions of people with dementia and key stakeholders regarding the use and impact of the social robot MARIO*. International Journal of Environmental Research and Public Health*, 17, 8621.

		https://www.mdpi.com/1660-4601/17/22/8621

GREY LITERATURE

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments. Short descriptions are provided below, as are links and/or PDF files. **Years:** 2010-1/2021		
	Title/ Summary	**Reference/Link**
1	**Robotics in Nursing** Registered nurses (RNs) and nurse practitioners (NPs) are accustomed to emerging technology impacting their environments and daily duties. While these advances in technology and equipment bring many positive changes, some trends like robotics are feared because of the possibility that they'll take jobs away from nurses. However, the opportunities for nurses and robots to work together, and the innate skills and characteristics of humans make RNs and NPs irreplaceable. There are numerous benefits to implementing robots in healthcare. It can help a facility save costs, reduce facility waste, and improve patient care. Ultimately, technology can provide sophisticated levels of measurability and traceability. Also the website illustrates an infographic created by the Duquesne University School of Nursing program showing: • The healthcare robotics market • Benefits of robots in healthcare • Famous nurse robots • Why humans are irreplaceable • How nurse robots offer a helping hand, create and expand career opportunities	Family Nurse Practitioner. DUQUESNE UNIVERSITY (2020). Robotics in Nursing. Available at: https://onlinenursing.duq.edu/blog/robotics-in-nursing/. (Accessed on: 2/02/2012)
2	**Will These Nurse Robots Take Your Job? Don't Freak Out Just Yet** A Blog written by a nurse describing the usage of robots in healthcare and the care of elderly. She is writing that in Japan, human-like robots are already being utilized as	Hamstra, B. (2018). *Will these nurse robots take your job? Don't freak out just yet.* Available at: https://nurse.org/articles/nurse-robots-friend-or-foe/

	supplemental healthcare workers in elderly homes across the country. Larger robotic machines can be used to carry-out laborious physical tasks like moving patients, and smaller interactive robots are being used to combat loneliness and inactivity in the elderly population. Also she describes some kinds of robots created by Japanese like Robot nurse bear capable of lifting a patient from standing position or from the floor, transferring a patient to a wheelchair, carrying a patient from point A to B, and turning patients in bed, and robots Paro, Pepper, and Dinsow. Each of these robots serves a vital role in the Japanese healthcare system. The view of the nurse is that Prototypes resembling "robot nurses" could have both negative and positive impact. A potential con of robotic nursing is the ability for intelligent online hackers to infiltrate the healthcare databases and gain access to sensitive private information. Another possible drawback of robotic nursing aid is the lack of "human touch." And of course, more robots as nurses might mean less demand for nurses, although probably unlikely. It is more likely that the aid of robotic nursing will just allow nurses to fulfil more meaningful duties and work stressors would decrease. Moreover, the potential benefits of robotic nursing far outweigh the drawbacks.	(Accessed on: 8/02/2021)
3	**Transcultural Robotics Nursing** The webpage refers to **CARESSES** which is an international, multidisciplinary project whose goal is to design the first robots that can assist older people and adapt to the culture of the individual they are taking care of. CARESSES is funded by the European Commission and the Ministry of Internal Affairs and Communications of Japan. The project started on the 1st January 2017. Robots that can respond to older people's needs in a sensitive and culturally appropriate way are more likely to be trusted and accepted. This is of global importance as ageing populations across the world demand more health and social care resources. Culturally competent robots can relieve the pressures on caregivers in hospitals and care homes.	*Research Centre for Transcultural Studies in Health.* Transcultural Robotics Nursing. Available at: https://cultureandcompassion.com/transcultural-nursing-robotics (Accessed on: 8/2/2021)

4	**Social Assistive Robotics and children with paediatric surgical problems: The experience of the health professionals** The aim of the research was to investigate the effect of NAO social assistance robot, in the pain and discomfort of children with paediatric health problems and the experience of health professionals (Doctors and Nurses) and parents using the NAO robot was investigated by health professionals. The majority of interview health professionals (n=7 surgeons and 3 nurses) agreed that attendance of the NAO social assistance robot facilitated their practice in its field doctor's office. Either calming and relaxing the children, or creating one more friendly examination environment, promoting cooperation between professional's health and the child, during the medical intervention. The NAO seems to make the children happier and more cooperative. It is also reported that the NAO creatively engaged the children, facilitating medical intervention and saved the doctor time by giving the child information himself for intervention. Most participants considered the possibility of its permanent use in the hospital positive. It was mentioned that NAO is enjoyable for children and makes the hospital area more friendly for young patients. The presence of the NAO, at unfamiliar and often frightening hospital environment, it seems to reduce children's stress, as it occupies them making them less nervous and more cooperative.	Tsoulfaidou, V. (2019) *Social Assistive Robotics and children with paediatric surgical problems: The experience of the health professionals*. Postgraduate thesis. University of Macedonia, Greece. Available at: https://dspace.lib.uom.gr/bitstream/2159/23254/4/TsoulfaidouVickyAnnetaMsc2019.pdf (Accessed on: 8/02/2021)
5	**Robotics in Social Care: A Connected Care EcoSystem for Independent Living" UK-RAS White Paper Series on Robotics and Autonomous Systems (RAS)** Social care throughout the UK is under unprecedented pressure due to the ageing population. This challenge will not be solved through technology alone, nevertheless, as a nation UK has a history of responding effectively to such crises through creativity and invention. Innovation, including through advanced robotic and autonomous systems, can have an important role to play. The UK has a growing RAS and artificial intelligence (AI) sector, an increasingly integrated National Health Service, is pioneering in telehealth and is recognised as a global innovator. This white paper discusses the potential for RAS to provide long-term sustainable social care solutions and for the UK to be world leading in	UK -RAS NETWORK (2017) *Robotics in Social Care: A Connected Care EcoSystem for Independent Living- UK-RAS White Paper Series on Robotics and Autonomous Systems (RAS).* Available at: https://www.housinglin.org.uk/_assets/Resources/Housing/OtherOrganisation/UK_RAS_robitics-in-care-report.pdf (Accessed on: 15/02/2021)

	this field. The report highlights the challenges, opportunities, ethical and societal issues and provides a roadmap towards the enhancement of UK social care through RAS.	
6	**Socially Assistive Robots in Elderly Care. The attitudes of healthcare professionals towards the use of Socially Assistive Robots** Due to an increased demand in the long-term elderly care as result of the ageing population, high staff turnover and staff shortages, the burden for the working healthcare professionals is increasing. To prevent this burden, socially assistive robots can be helpful. The attitudes of the professionals in the elderly care organisation towards the use of socially assistive robots can differ per individual and per profession and the attitudes are influenced by several determinants. This study has the aim to examine the attitudes of the different professionals in the elderly care organisation towards the use of socially assistive robots and the determinants that influenced these attitudes. Results: The attitudes of the respondents were divided in the respondents with a positive and open attitude and the respondents with a wait-and-see attitude. The determinants that seemed to have a positive effect on the attitudes were compatibility, complexity, knowledge, self-efficacy, awareness of content of innovation, client cooperation, relevance for client and social support. The determinants with a twofold effect were observability, personal benefits/drawbacks and time available. The determinant coordinator/leadership had a negative effect on the attitudes of the respondents with a wait-and-see attitude and the determinant subjective seemed to have no influence on the attitudes. This study did not find an answer on differences between professions, but it found that respondents with a coordinating or facilitating role had more positive attitudes than their colleagues. The moderators that seemed to influence the relation between the determinants and attitude are the gender and level of education.	Schutte, M. (2019). *Socially Assistive Robots in Elderly Care. The attitudes of healthcare professionals towards the use of Socially Assistive Robots.* Master thesis. University of Twente, Netherlands. Available at: http://essay.utwente.nl/79233/1/Schutte_MA_TNW.pdf (Accessed on: 15/02/2021)
7	**MARIO: Managing active and healthy aging with use of caring service robots | EUROPEAN INNOVATION PARTNERSHIP (europa.eu)** MARIO addresses the difficult challenges of loneliness, isolation and dementia in older persons through innovative and multi-faceted inventions delivered by service robots. The	EUROPEAN INNOVATION PARTNERSHIP - European Commission. (2021) *MARIO: Managing active and healthy aging with use of caring service robots* - EUROPEAN INNOVATION PARTNERSHIP - European Commission. Available

	effects of these conditions are severe and life-limiting. They burden individuals and societal support systems. Human intervention is costly, but the severity can be prevented and/or mitigated by simple changes in self-perception and brain stimulation mediated by robots. From this unique combination, clear advances are made in the use of semantic data analytics, personal interaction, and unique applications tailored to better connect older persons to their care providers, community, own social circle and to their personal interests. Each objective is developed with a focus on loneliness, isolation and dementia. The impact centres on deep progress toward EU scientific and market leadership in service robots and a user driven solution for this major societal challenge. The competitive advantage is the ability to treat tough challenges appropriately. In addition, a clear path has been developed on how to bring MARIO solutions to the end users through market deployment.	at: https://ec.europa.eu/eip/ageing/repository/mario-managing-active-and-healthy-aging-use-caring-service-robots_en.html (Accessed on: 26/02/2021)
8	**Report with recommendations to the Commission on Civil Law Rules on Robotics** The development of robotics in the field of care for the elderly has gradually become more common and less expensive and produces products with greater functionality. As long as robots have the potential to improve the mobility and sociability of people with disabilities and the elderly, humans will continue to be needed for care and will continue to be an important rather than a completely replaceable source of social interaction. Medical robots also have the potential to reduce health care costs, allowing health professionals to shift their focus from treatment to prevention and making the bulk of the budget available to better adapt to patients, health professionals and research. For communication between humans and robots and artificial intelligence devices is a fundamental need for a high level of security privacy and privacy protection.	Mayer and Boni (2017) for European Parliament. Meeting document. Available at: https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EL.pdf https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html (Accessed on: 18/03/2021)
9	**White Paper on Artificial Intelligence. A European approach focused on excellence and trust** Through this White Paper, the European Commission launches a wide-ranging consultation of civil society, industry and academia in the Member States, with concrete	European Commission, 2020 https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf

	proposals on a European approach to AI. AI is a strategic technology that offers many benefits to citizens, businesses and society, provided that it is human-centered, ethical and sustainable and respects fundamental rights and values.	

4. National Peer Review and Grey Literature

Social changes, such as population ageing and progress in technology make the social assistive robots necessary (Anghel et al., 2020; Grignoli et al., 2020; Papadopoulos et al., 2020; Honekamp et al., 2019).

No national peer reviewed articles related to robots and health/nursing were found in this search in **Cyprus**. However, **Greek (Greece)** literature was found, according to which robots can be used in children with autism spectrum disorder (Fachantidis et al., 2018; Syriopoulou-Delli and Gkiolnta, 2020). Specifically, during interaction with robots, behaviours such as increased attention and ability to follow instructions were improved (Fachantidis et al., 2018). Tsoulfaidou (2019), in grey literature, mentioned the effect of robots in children with paediatric health problems. It seems that robot made the hospital more friendly and promoted cooperation between health professionals and child.

In **German speaking literature (Austria, Germany, Switzerland) important literature was found.** A minority of general population in Germany already accept functioning care of robots-provided that human care is not replaced, but only supported (Rebitschek, 2020). According to Kiemel (2018) robotic assistance system can offer support in complex care situation especially in palliative and intensive care and also in supporting older people. Further, Honekamp et al. (2019), mentioned the necessity of nursing robots in view of the shortage of nurses.

According to grey literature, technological trends in the field of robotics and neurotechnology are increasingly leading to merging of human and machine. The core of the explanation is to consider the responsibility for damage caused by autonomous and non-autonomous robots in the field of medicine and nursing (Brand, 2019). The current state of knowledge digitization in nursing offers many opportunities, but it also entails risks and disadvantages (Zentrum für Qualität in der Pflege, 2019). Some of the disadvantages mentioned by Bendel et al. (2018), are the cost intensity and the complexity of the requirements.

Italian peer reviewed literature states that robots can be used for human needs (Ciardo et al., 2020). They can promote and support development motivate people to perform physical exercises, engage them in conversation, check their health state, reduce their sense of loneliness, have a positive impact on emotional, personal and social life (Balisteri, 2018; Ciardo et al., 2020; Balistreri, 2021). Robots can also be used on educational context (Lehmann and Rossi, 2020) and in pandemic situations- such as the current Covid-19 (Gasparini, 2019).

On the contrary, grey literature and specifically Redazione di Nurse Time (2019) and Marino (2020), mentioned that robots may play an important role in many tasks, such as in surgery (Catanzaro, 2018; Scollo, 2019), but they will not be able to substitute human in care because of the lack of emotions and the empathy with the person.

Salvini (2019), Damiano (2020) and Kruszewski (2020) studies, analysed some of the possible psychological hazards arising from the use of social robots. Some of them are the acceptance or non-acceptance of social robots, the perceived sense of security and the sense of anxiety felt by the users. Further, Pennazio (2019), Pucciarelli et al. (2020) studies, showed that robots produced significant positive change in motor skills, verbal and preverbal skills, social reciprocity and emotional expression on children with autism spectrum disorder.

Majidi (2020) in grey literature, emphasized that the first aspect that needs to be clarified in the legislation is that of responsibility.

In **Romania**, integrated care services are using assistive technologies in older adults and during surgery (Anghel et al., 2020; Andras et al., 2020).

In regard to grey literature Nicolae (2020), reported the use of robots for Covid-19 to disinfect hospitals, take patients' temperature and blood pressure, and to transport samples.

In **UK** there is extensive literature regarding the use of robots. According to Winkle et al. (2020), socially assistive robots (SAR) are increasingly employed in socially complex domains such as healthcare and independent living.

Grey literature outlines the economic and social implications of using robots, ethical and legal issues, as well as implication for funding and innovation (House of commons science and technology committee, 2016; HM Government, 2017; Salman, 2018). Robots could stand in for jobs that are dangerous and difficult for humans to do or help human workers to do tasks that cannot be automated (Royal Academy of Engineering, 2016; UK parliament, 2016). Robots could help meet the needs of ageing population (HM Government, 2017), in industry, education and training bodies (House of commons science and technology committee, 2016), in social care (UK-RAS White Paper, 2017), in healthcare (Concilium Research and Consultancy and skills for care, 2018).

AUSTRIA (and German speaking literature- including Germany, Switzerland)

PEER REVIEWED ARTICLES

NATIONAL

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in AT. Short descriptions of each article are provided as are links and/or PDF files.

Years: 2018-1/2021

	Summary	**Reference/Link**
1	Due to the demographic change, an increasing gap between growing numbers of elderly people in need of care and a shrinking labor force in the professional care sector is expected. The use of nursing robots is discussed as an option to mitigate this problem. Based on TechnikRadar (2018), a representative survey of the German population, the authors discuss the acceptability of nursing robots by the German public. The results of these analyses demonstrate that the perception of nursing robots depends on the context and the expected societal consequences of their use. The authors problematize whether, in a rapidly digitalizing society, technological solutions will be developed beyond the needs, expectations, and competences of potential users, leading to both resistance and alienation. (Germany)	Zwick, M. M. and Hampel, J. (2019) "Cui bono? The pros and cons of robotics in geriatric care. (Results of a representative survey in Germany), *TATuP - Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis*, 28, 2*, p. 52-57.* DOI: https://doi.org/10.14512/tatup.28.2.s52
2	Robots in care as problem of socio-technical interconnecting. Theoretical proposals by technology studies for nursing (science). Care and robotics already bear a whole range of relations: Under the conditions of demographic change, robotic assistive systems are celebrated as solution or feared for their potential dehumanising effects. Contrary to such black-and-white positions the paper proposes a middle ground based on insights from Science and Technology Studies: Here, robotics and care denote a problem of socio-technical interconnecting, where social and technical concerns need to be viewed as closely linked. Such a	Fehling, Patrick (2019): "Entwicklungsstand der gegenwärtigen und künftigen technischen Assistenzsysteme." (Development status of the current and future technical assistance systems) In: Pflege&Gesellschaft, 24, 3, p. 63. https://dg-pflegewissenschaft.de/wp-content/uploads/2020/09/PG-3_2019.pdf

	perspective provides nursing (science) with new possibilities for intervening into and shaping this issue. These consist largely in involving nursing expertise as early as possible in processes of robotic development, in integrating reflexive accounts of technology in nursing education, and in engaging publics beyond scientific discourse in the shaping of future care arrangements. (Germany)	
3	In the SeRoDi research project, Fraunhofer IPA, together with partners, developed two new service robots for stationary care: the intelligent care trolley, which navigates autonomously and automatically detects objects that have been removed, and the robotic service assistant, which also navigates autonomously and offers drinks and snacks to patients or residents in common rooms. The developments were used for practical tests in several nursing homes for the elderly and the sick. The Fraunhofer IPA has been developing service robots and assistance systems for many years with the aim of relieving the staff in inpatient care and thus giving them more time to deal directly with patients. (Germany)	Graf, Birgit (2019): "Neue Servicerobotik-Lösungen für die stationäre Pflege." (New service robotics solutions for inpatient care) In: Pflegezeitschrift, 72, 1, p. 20–23. DOI: 10.1007/s41906-018-0002-2
4	In view of the aging of society and the high costs of support and care in private households, the question arises as to what role assistive robots can play. This article addresses the question of the extent to which robots are accepted in care by the adult population in Germany today. And to what extent do gender, age and experience (professional, personal) influence the extent of this acceptance? The evaluations carried out are based on three representative surveys with a total of over 7,000 respondents. Two surveys were carried out in the second half of 2017 on behalf of the German Academy of Science and Engineering (acatech) and the life insurer ERGO, the third survey on behalf of the Expert Council for Consumer Questions (SVRV) in spring 2018. An in-depth and cumulative analysis of these surveys and data sets, which were co-designed by the authors, with regard to assistive robotics has not yet been published. Despite different usage scenarios for robots in care, the results of all 3 surveys agree surprisingly: In Germany there is a significant minority of people who would already accept functioning care of robots - provided that human care is not replaced, but only supported. A good third, who are differentiated according to age and gender, generally reject the assistance of robots. (Germany)	Rebitschek, Felix G.; Wagner, Gert G. (2020): "Akzeptanz von assistiven Robotern im Pflege- und Gesundheitsbereich." (Acceptance of assistive robots in the care and health sector) In: Zeitschrift für Gerontologie und Geriatrie, 53, 7, p. 637–643. DOI: 10.1007/s00391-020-01780-9
5	Both in a scientific context and in society there is a debate about whether emotional robots can support older people in meeting psychological and social needs. They are	Baisch, Stefanie et al. (2018): "Emotionale Roboter im Pflegekontext. Empirische Analyse des bisherigen Einsatzes

	already used in German care facilities, but hardly any use was made of this practical experience to analyze the benefits and effects of the robots. The present article is therefore a first empirical analysis of experience on the use of emotional robots in a care context. This records the current use and the effects reported by the nursing staff, as well as the importance of psychosocial needs for the acceptance and use of emotional robots. (Germany)	und der Wirkungen von Paro und Pleo“ (Emotional robots in a care context. Empirical analysis of the previous use and effects of Paro and Pleo) In: Zeitschrift für Gerontologie und Geriatrie, 51, 1, p. 16–24. DOI: 10.1007/s00391-017-1346-8
6	Amyotrophic lateral sclerosis (ALS) is a disease that requires a high degree of care. Robotic assistance systems can offer support in complex care situations, especially in palliative and intensive care - if they are used responsibly. In the research and development project ROBINA, a robot arm is being prepared for use at the ALS. Ethical, legal and social aspects (ELSA) are taken into account in requirements studies and project steps. Potential user groups are included in the course of the project, which means that they can be adapted to real conditions in line with requirements and needs. Social relationships can thus be relieved of repetitive minimum and comfort actions. Self-determination and the quality of life of those affected are improved at the same time. The research project is funded by the BMBF until 2020. (Germany)	Kiemel, Diana; Brukamp, Kirsten (2018): “Robotische Assistenz bei amyotropher Lateralsklerose (ALS).“ (Robotic assistance in amyotrophic lateral sclerosis) In: Pflegezeitschrift, 71, 4, p. 56–58. DOI: 10.1007/s41906-018-0464-2
7	The EU research project "HOBBIT" has developed prototypes of assistive robots to support a safe and independent life and tested them in older people in their home environment. The “personAAL” project investigated whether different behaviors (“personalities”) of such a robot prototype with otherwise the same function (conveying a message) are perceived by test persons as different personalities. The robot was equipped with two behaviors (introvert / extrovert) and demonstrated to 13 test subjects (mostly older people or experts from the care sector). The “extroverted” robot was by far the most preferred. Significant differences in perception were found for the sub-questions “anthropomorphism” and “liveliness” as well as in the overall assessment, but not for the sub-questions “sympathy” and “security”. There was no significant correlation between the preferred behavior of the robot and the self-assessment of the test person as being introverted or extroverted.	Mayer, Peter; Panek, Paul (2018): “Assistenzroboter mit ‘Persönlichkeit’ ausstatten?“ (Equip assistance robots with ‘personality’?) In: Pflegezeitschrift, 71, 7, p. 44–47. DOI: 10.1007/s41906-018-0593-7

	It can be assumed that the acceptance of a robot does not depend purely on its sober function, and it will therefore make sense to offer different behaviors to choose from for better acceptance. (Germany)	
8	In the media more and more can be read about “care robots” as a possible solution for the current lack of qualified care staff but often without differentiating this term any further. This often leads to the assumption that robots are already able to take over physical care tasks with patients; however, current solutions primarily have assistive functions. The goal of this article is to elaborate for which application areas products already exist and which topics current research projects are dealing with based on concrete examples. On the one hand, assistive robots are presented that are designed to support staff in senior care institutions and hospitals. On the other hand, assistive robots are presented that support older persons or persons in need of care in their daily lives. These observations show that existing products either provide only reduced interaction capabilities or have only limited autonomy or “intelligence”. Assistive robots providing more extensive, also physical interaction abilities and complex autonomous behavior are still a research topic. (Germany)	Graf, Birgit (2020): “Assistenzroboter für die Pflege.” (Assistant robot for care) In: Zeitschrift für Gerontologie und Geriatrie, 53, 7, p. 608–614. DOI: 10.1007/s00391-020-01782-7
9	In view of the shortage of skilled nurses, there is discussion, among other things, of using nursing robots to care for the elderly in hospitals. 120 senior citizens in a supervised residential complex were asked about their attitude towards the care robot models RIBA, Care-O-bot, Pepper and Paro. The respondents do not generally reject care robots in hospitals, but acceptance and skepticism depend heavily on the application scenario. When seniors receive information about care robots, it can spark their curiosity about new technologies. Most respondents assume that care robots can relieve care workers physically and in terms of time. It can be assumed that the acceptance of care robots will increase if those affected are involved in technology development and its integration into care practice. (Germany)	Honekamp, Ivonne et al. (2019): “Akzeptanz von Pflegerobotern im Krankenhaus.“ (Acceptance of care robots in the hospital) In: TATuP - Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis, 28, 2, p. 58–63. DOI: 10.14512/tatup.28.2.s58
10	The article deals with the acceptance of social robotics. A participatory approach to the development of a humanoid robot is presented, supplemented by initial feedback from the practice of elderly care. The focus here is on a reconstruction of the subjective perspectives of various participants such as specialists, relatives and addressees on robotics: How do these groups react to the robot "Pepper" and how do the reactions change in the course of the interaction? (Germany)	Gaby Lenz; Jens Lüssem; Hannes Eilers; Hannah Wachter (2019): “Soziale Robotik in der Altenpflege. Zwischen Unbehagen und Neugier“ (Social robotics in elderly care. Between discomfort and curiosity) In: Soziale Arbeit, 170, 11 , p. 402-409.

		https://www.dzi.de/soziale-literatur/soziale-arbeit/archiv/jahrgang2019/?heftid=170#170

GREY LITERATURE

NATIONAL

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in AT. Short descriptions are provided below, as are links and/or PDF files. **Years: 2018-1/2021**		
	Title/ Summary	**Reference/Link**
1	**Robotics and assistive neurotechnologies in care - societal challenges: deepening the project "Human-machine delimitation." - A work report of the German office for technology consequences depreciation** Technological trends in the field of robotics and neurotechnologies are increasingly leading to a merging of man and machine. In view of demographic change, the area of care and health is an important field of application for such developments. In the future, a sharply increasing need for care and a worsening shortage of skilled nurses are to be expected, which - as is sometimes postulated - can only be managed with the increased use of new technologies. Particularly autonomous service robots are ascribed great potential to relieve care workers and support those in need of care in everyday life - corresponding applications are being developed and tested. At the same time, it is obvious that, due to the fragile constitution of those in need of care, care is a morally extremely sensitive area, so that many normative challenges arise. Care for the elderly is thus a field in which the ambivalences of man-machine delimitation are paradigmatic. The TA project focused on the following questions:	Kehl, Christoph (2018): Robotik und assistive Neurotechnologien in der Pflege - gesellschaftliche Herausforderungen: Vertiefung des Projekts "Mensch-Maschine-Entgrenzung." (= TAB-Arbeitsbericht) (Robotics and assistive neurotechnologies in care - societal challenges: deepening the project "Human-machine delimitation." (A work report of the German office for technology consequences depreciation) https://edocs.tib.eu/files/e01fn18/1028962444.pdf https://www.tab-beim-bundestag.de/de/untersuchungen/u106002.html

	1. What can robots contribute to good care and what ethical challenges arise from the increasing use of technology and in particular the automation of everyday care? 2. What are the current regulations for handling robotic care technologies, especially with regard to security, liability and data protection issues, and are they appropriate to the challenges ahead? 3. What could an appropriate design of technology development look like in order to obtain needs-oriented and acceptable solutions? (Germany)	
2	**Digital Anthropology: Ethical Problems of Using Artificial Intelligence and Robotics in Nursing and Medicine** Robotics and artificial intelligence are on the agenda, practice to revolutionize medicine and care. Come in addition the potential of the analysis of those reported in social media Information that can be used for medical purposes should be made. This results in an abundance ethical challenge. A forward-looking ethical Reflection needs to develop legal regulations They must be transnationally binding, should they take effect. At the European level Ethical principles were proposed for the Union Development and application of robotics and artificial Intelligence submits. It is important to operationalize them. This becomes paradigmatic on the basis of concretions ethical problems in the application of robotics and artificial intelligence. (Germany)	Sahm, Stephan (2019): "Digitale Anthropologie: Ethische Probleme der Anwendung künstlicher Intelligenz und Robotik in der Pflege und Medizin." (Digital Anthropology: Ethical Problems of Using Artificial Intelligence and Robotics in Nursing and Medicine) In: Medizinrecht, 37, 12, p. 927–933. DOI: 10.1007/s00350-019-5395-4
3	**Liability and insurance when using robotics in medicine and care** This contribution is about Liability and insurance when using robotics in medicine and care. The core of the explanations is to consider the responsibility for damage caused by autonomous and non-autonomous robots in the field of medicine and nursing, and the possibility of giving this responsibility a salary through insurance. The allegedly unclear liability regime and its equally unclear financing are named by the EU Parliament in its resolution as important reasons for the skepticism expressed about the use of robotics in the healthcare sector. (Germany)	Brand, Oliver (2019): "Haftung und Versicherung beim Einsatz von Robotik in Medizin und Pflege." (Liability and insurance when using robotics in medicine and care) In: Medizinrecht, 37, 12, p. 943–950. DOI: 10.1007/s00350-019-5398-1
4	**Service robotics for care** To create new service robot solutions for inpatient care, was the aim of the "SeRoDi" project: service robotics for personal services. The intelligent care trolley and the robotic	Springer Medizin (2018): "Servicerobotik für die Pflege." (Service robotics for care) In: Heilberufe, 70, 12, p. 44–45. DOI: 10.1007/s00058-018-3813-z

	Service assistants, developed by Fraunhofer IPA with partners, also had to prove themselves in practice. (Germany)	
5	**Robots in care - a way out of the personnel emergency?** Interview with Prof. Sami Haddadin Principal of the Munich School of Robotics and Machine Intelligence (MRSM) about "Robots in care - a way out of the personnel emergency?" (Germany)	Springer Medizin (2019): "Roboter in der Pflege — Ein Ausweg aus dem Personalnotstand?" (Robots in care - a way out of the personnel emergency?) In: Geriatrie-Report, 14, 2, p. 6–7. DOI: 10.1007/s42090-019-0211-x
6	**About people, machines and other helpful beings** Digitization and robotization are developments that challenge the health system as a whole, but in a particular way, nursing care. In a fundamental way, care is relationship work, and so the question of how the relationship to the robots is designed is of particular importance. Robots are no longer simple tools or machines that we use according to our own requirements. Robots, as they are currently being developed for care, are complex technical counterparts that enter into social interaction with humans, although it is not yet clear which social and consequently which normative status we should assign to these manifestations. The article offers some landmarks for this discussion from an ethical and anthropological perspective. (Germany)	Manzeschke, Arne (2019): "Von Menschen, Maschinen und anderen hilfreichen Wesen." (About people, machines and other helpful beings) In: Ethik Journal, 5, 1, p. 11. https://www.ethikjournal.de/fileadmin/user_upload/ethikjournal/Texte_Ausgabe_1_11_2019/Manzeschke_1.Nov_FINAL.pdf
7	**Care: Pepper enchants in Lower Franconia** A robot has been supporting the day care staff in Erlenbach since the beginning of the year. The care management already sees him as a help. A site visit. (Germany)	Schmitt-Sausen, Nora (2019): "Pflege: Pepper bezaubert in Unterfranken" (Care: Pepper enchants in Lower Franconia) In: Deutsches Ärzteblatt, 116, 17, p. 835. https://www.aerzteblatt.de/archiv/206944/Pflege-Pepper-bezaubert-in-Unterfranken
8	**Care robots from an ethical point of view** Robots are a constant topic in the media, science and society. You can now see them everywhere. They are even gaining ground in the health sector. In this article, care robots are discussed from a sociological and ethical point of view. Both opportunities and risks are of interest. The robot is not seen as a panacea or as an enemy and competitor, but as	Bendel, Oliver (2019): "Pflegeroboter aus ethischer Sicht." (Care robots from an ethical point of view) In: BdW Blätter der Wohlfahrtspflege, 166, 1, p. 24–27. DOI: 10.5771/0340-8574-2019-1-24

	an instrument that can have one or the other effect. (Germany)	
9	**Intelligent helpers for seniors** What should a robot be able to do and how should it behave so that it is well accepted by older people? The NIKA project, funded by the Federal Ministry of Research, has been addressing these questions since mid-June 2018. The welfare organization for Baden-Württemberg works with four partners from science and industry to find out how robots can meaningfully support seniors in their everyday lives. (Germany)	Springer Medizin (2018): "Intelligente Helfer für Senioren. " (Intelligent helpers for seniors) In: Heilberufe, 70, 9, p. 46–46. DOI: 10.1007/s00058-018-3633-1
10	**Nursing and digital technology** According to the current state of knowledge, digitization in nursing offers many opportunities - but it also entails risks and, above all, many questions: What is the spectrum of digital support systems like today - and what could everyday care routine look like in 30 years' time? What opportunities do technology experts see at all? Will artificially intelligent transfer aids, robot arms and networked care glasses really be natural helpers? Are the citizens becoming transparent patients with whose data large corporations operate profitable business models, but in the end do not the users themselves benefit in terms of health? And what do the people in Germany and professional carers think about digital applications in care? The new ZQP report "Nursing and digital technology" offers insights into these and other important questions about the use of digital technology in nursing. (Germany)	Zentrum für Qualität in der Pflege (2019): "Pflege und digitale Technik." (Nursing and digital technology) https://www.zqp.de/digitalisierung-pflege/
11	**Care robots** This open access book bundles technical, economic, medical and ethical reflections on care robots. Care robots, currently mostly prototypes, support or replace human care workers or carers. They bring the sick and elderly the medicines and food they need, help with lying down and standing up, or alert the emergency services. The advantages of care robots are continuous usability and consistent quality of the service. Disadvantages are cost intensity (with possible amortization) and complexity of the requirements. Under the scientific direction of Prof. Oliver Bendel, in September 2017, he met representatives from various scientific disciplines as part of a Ladenburg discourse organized by the Daimler and Benz Foundation to talk about the current and future use of care robots and	Bendel, Oliver; Daimler und Benz Stiftung (Eds.) (2018): „Pflegeroboter." (Care robots) Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-22698-5

	to identify research potential. In their contributions, the authors also address questions from business, medical and information ethics: Who is responsible for incorrect support and supply by the machine? To what extent can this support or endanger the personal and informational autonomy of the patient? Is the robot a relief or a competitor for caregivers? Answers must be found by science and society. The content: • Care robots from a technical point of view • Current examples of care robots • Robots in nursing care • Ethical challenges and guidelines • Care robots with sexual assistance functions. Oliver Bendel is a lecturer in business informatics, business ethics and information ethics. He conducts research in the areas of information ethics and machine ethics. From this perspective, he also deals with care robots. (Germany)	
12	**The potential of nursing robotics. A systemic exploratory research** This book shows how a research process can be successful using the exploratory setup method. The subject of investigation is nursing robotics. Simulations are carried out with exploratory constellations that open up new perspectives on the use, risks and challenges of nursing robotics. The work provides answers to questions about nursing robotics in the context of management and organizational development in nursing companies: Which measures promote the use of nursing robotics? What interactions and relationships do the actors in the care system have with one another and what impact does care robotics have on them? The entire exploration process of this work is characterized by the development of knowledge-guiding theses, which are discussed by experts in a workshop and serve as design recommendations in practice. (Germany)	Pijetlovic, Denis (2020): "Das Potential der Pflege-Robotik. Eine systemische Erkundungsforschung." (The potential of nursing robotics. A systemic exploratory research) Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-31965-6
13	**Human-robot collaboration** In the context of Industry 4.0, there is growing competitive pressure, ever greater demands on flexibility and quality, and ever higher demands on the part of stakeholders. In the familiar situation of demographic change, new assistance systems are increasingly emerging, especially in human-robot collaboration (HRC). These systems no longer work in isolation behind fences, but hand in hand with people. They should support or relieve	Buxbaum, Hans-Jürgen (2020): "Mensch-Roboter-Kollaboration." (Human-robot collaboration) Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-28307-0

	people in monotonous or exhausting work. The direct cooperation between man and machine means that work safety and ergonomics are increasingly becoming the focus. There is a need for clarification regarding the design of HRC workplaces and the acceptance of these workplaces. New areas of responsibility are also under discussion, which can be opened up, for example, in care and medicine. Work psychology and human factors are taking on a new and important meaning in robot-based automation. In addition, the ethical question arises as to whether these new robots will relieve or replace people in the long term. The background to this publication is the Daimler and Benz Foundation's Ladenburg discourse on HRC in March 2019. This is extremely well staffed with a clearly interdisciplinary orientation that is so far unique in this topic. The participants are the authors of this book. (Germany)	
14	**Robotics for good care opinion - A statement of the German ethics council on Robotics for good care** Technical developments are playing an increasingly important role in discourses on the development of nursing care. In the opinion of the German Ethics Council, it must not only be about how nursing staff can be supported and relieved by technical assistance, but also about the importance of new technical products for the further development of nursing, for example in the direction of activating or go to rehabilitative care. Technical systems must not replace the interaction process in care; they should complement it. (Germany)	Deutscher Ethikrat (2020): "Robotik für gute Pflege Stellungnahme." (Robotics for good care opinion - A statement) Berlin: Deutscher Ethikrat. https://www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/deutsch/stellungnahme-robotik-fuer-gute-pflege.pdf
15	**Robots in the care of the elderly. A statement of the Bioethics Commission of Austria** The Bioethics Commission of Austria sees the use of robots that are as human-like as possible as a political issue. The public debates on this topic are always led ideologically, with the assertion that with a steadily increasing longevity of the population in industrialized countries, we will not have enough caregivers for the elderly in the future. This also goes hand in hand with the expectation of cost savings in the care sector as a central argument. The Bioethics Commission therefore felt obliged to investigate these allegations and verify the facts. Technology development has to be oriented towards people's needs,	Bioethikkommission beim Bundeskanzleramt (2018): "Roboter in der Betreuung alter Menschen." (Robots in the care of the elderly) Vienna: Bioethikkommission beim Bundeskanzleramt. https://www.bundeskanzleramt.gv.at/dam/jcr:4f5000de-5d0f-457b-ba32-2621d1c7c2ae/Pflegeroboter.pdf

	what is technically possible must not dictate the areas of application. The discussion - although the field of robotics is very broad - focused on the care of old people who are no longer able to independently perform all activities of everyday life. The ethical aspects, above all autonomy versus control, data security and protection of privacy as well as "machine ethics" are in the foreground of this current discussion, which also extended to the appointment of the bioethics commission in July 2017. Details of the technical developments in the context of robotics and the very complex legal framework are deliberately not dealt with in the statement. (Austria)	
16	**Sustainability in healthcare through the use of service robotics** Digitalisation, digital assistance systems and robotics do not stop at the health sector. Nursing staff should be relieved of heavy physical and logistical work by service robots, while at the same time patients should be given the opportunity to shape the recovery process in the service segment themselves. The success of both strategies depends centrally on whether introduced service robots meet the load and interest profiles of both groups. This is the basis of any acceptance. Without sufficient fit and acceptance, even well-intentioned improvement efforts fizzle out.	Bläsing, Dominic et al. (2018): "Nachhaltigkeit im Gesundheitswesen durch den Einsatz von Servicerobotik." (Sustainability in healthcare through the use of service robotics) In: Psychologie und Nachhaltigkeit: Konzeptionelle Grundlagen, Anwendungsbeispiele und Zukunftsperspektiven. Edited by Claudia Thea Schmitt; Eva Bamberg. Wiesbaden: Springer Fachmedien Wiesbaden, p. 225–233. DOI: 10.1007/978-3-658-19965-4_19

CYPRUS (and Greek speaking- including Greece)

PEER REVIEWED ARTICLES

NATIONAL

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in AT. Short descriptions of each article are provided as are links and/or PDF files.
Years: 2018-1/2021

	Summary	Reference/Link
1	The current study investigates the outcomes of the interaction between four elementary school pupils with autism spectrum disorders and a robot called Daisy. During structured and prepared activities which were conducted by the social robot, as well as by a human partner. Results indicate positive outcomes during the interaction with the robot. Specifically, there were more incidences of eye contact, proximity and verbal interaction during sessions with the robot than during those with the teacher. Additional behaviors such as increased attention and ability to follow instructions improved during interaction with the robot. There was also a noted reduction in fidgeting.	Fachantidis, N., Syriopoulou-Delli, C., Zygopoulou, M. (2018). The effectiveness of socially assistive robotics in children with ASD. International Journal of Developmental Disabilities, 2-9. DOI: 10.1080/20473869.2018.1495391 https://doi.org/10.1080/20473869.2018.1495391 (Accessed on: 18/03/20210)
2	The use of socially assistive robotics (SARs) is a promising method for improving the social skills of children with autism spectrum disorder (ASD). Studies conducted in this field in recent years show that the use of robots as collaborators may have positive effects on the development of social skills in children with ASD, especially in those areas where they reveal great deficits. In this literature review, we present, organize and evaluate the most important features and results of 13 relevant scientific articles. In analysis of the research findings, we explored the documented effectiveness of robotics in enhancing the social skills of children with ASD in the areas of mutual attention, verbal	Syriopoulou-Delli C. & Gkiolnta E. (2020): Review of assistive technology in the training of children with autism spectrum disorders. International Journal of Developmental Disabilities https://doi.org/10.1080/20473869.2019.1706333 (Accessed on: 18/03/2021)

	communication and imitation skills, and also in the reduction of stereotypical behavior. Analysis of the results of the 13studies confirmed that robots can have positive immediate effects on the communication skills of children with ASD, which holds promise for future intervention programs and relevant research.	

GREY LITERATURE

NATIONAL

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in AT. Short descriptions are provided below, as are links and/or PDF files. **Years: 2018-1/2021**		
	Title/ Summary	**Reference/Link**
1	**Social Assistive Robotics and children with paediatric surgical problems: The experience of the health professionals** The aim of the research was to investigate the effect of NAO social assistance robot, in the pain and discomfort of children with paediatric health problems and the experience of health professionals (Doctors and Nurses) and parents using the NAO robot was investigated by health professionals. The majority of interview health professionals (n=7 surgeons and 3 nurses) agreed that attendance of the NAO social assistance robot facilitated their practice in its field doctor's office. Either calming and relaxing the children, or creating one more friendly examination environment, promoting cooperation between health professional and the child, during the medical intervention. The NAO seems to make the children happier and more cooperative. It is also reported that the NAO creatively engaged the children, facilitating medical intervention and saved the doctor time by giving the child information himself for intervention. Most	Tsoulfaidou, V. (2019) Social Assistive Robotics and children with paediatric surgical problems: The experience of the health professionals. Postgraduate thesis. University of Macedonia, Greece. https://dspace.lib.uom.gr/bitstream/2159/23254/4/TsoulfaidouVickyAnnetaMsc2019.pdf (Accessed on: 8/02/2021)

	participants considered the possibility of its permanent use in the hospital positive. It was mentioned that NAO is enjoyable for children and makes the hospital area more friendly for young patients. The presence of the NAO, at unfamiliar and often frightening hospital environment, it seems to reduce children's stress, as it occupies them making them less nervous and more cooperative.	
2	**Socially Assistive Robots for social and psychological support of children with chronic diseases** The study examines the interaction of the robot Nao with children suffering from cancer or leukemia and being hospitalized for a long period. Certain activities were designed to improve children's social skills, to help children manage the disease and get familiarized with the medical procedures. The participants were 6 children from the pediatric oncology department of the AHEPA University hospital. Initially, 8 interventions were designed, 4 for the first cycle and 4 for the second. The sessions' purposes were the same in both cycles; however, the roles and the scenarios were changed. Due to some problems during the intervention, only the first cycle was held. The results from children-robot interaction were positive. More specifically, from children's attitudes towards the robot, the identification with the robot and the children's emotional alteration during the sessions, it seemed that the children had fun, communicated and expressed their thoughts and feelings. The robot was a motive for the child to talk about the disease and its problems and think how to manage them.	Pampaliari, S. (2018). Socially Assistive Robots for social and psychological support of children with chronic diseases. Postgraduate thesis. University of Macedonia https://dspace.lib.uom.gr/bitstream/2159/22067/3/PampaliariStellaMsc2018.pdf (Accessed on: 18/03/2021)

ITALY

PEER REVIEWED ARTICLES

NATIONAL

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in IT. Short descriptions of each article are provided as are links and/or PDF files. **Years: 2018-1/2021**		
	Summary	**Reference/Link**
1	In human beings, complex socio-cognitive skills develop through social interaction. Nowadays, children are exposed to several types of agents, artificial and not, who, through the interaction can promote and support development. In this work, the authors firstly discuss the application of socially assistive robots in therapeutic contexts with children. Specifically, they focus on studies conducted on neuro-motor and socio-cognitive rehabilitation in children affected by cerebral palsy or autism, highlighting the advantages and limits of social assistive robotics (SAR). Secondarily, authors propose an interdisciplinary approach that combines neurocognitive science methods with robotics in order to develop robots that induce social cognition mechanisms in humans. Finally, they present some guidelines for an interdisciplinary approach to SAR.	Ciardo F., Wykowska A., La Robotica Assistenziale Sociale come Strumento per promuovere lo sviluppo Socio-Cognitivo: Vantaggi, Limiti e Prospettive Future / Social assistive robotics as a tool to enhance socio-cognitive development: Benefits, limits, and future directions, Sistemi Intelligenti, 1/2020, pp. 9-25, DOI: 10.1422/96277, Il Mulino (Google Scholar) https://www.rivisteweb.it/doi/10.1422/96277
2	The article argues that the development of robots should not be considered as a threat, since we can use robots for our needs and, at the same time, have important relations with other human beings. The article considers the possibility that, in the future, robots will take the place of health and social care in assisting people. However, it is not obvious that robots will produce more loneliness: on the opposite, the article argues that they might even increase our social relationships. Specifically, it is suggested that robots may perform some specific tasks whereas social- and health-care operators may be responsible of a “deeper care” that takes into account the individual needs of the person.	Balistreri M., I robot della cura sono una risorsa e non una minaccia per le nostre relazioni sociali / Care robots are a resource and not a threaten for our social relations. NEU, ottobre 2018, pp. 29-36. https://core.ac.uk/download/pdf/302263091.pdf
3	The article introduces a special issue of the NEU Magazine focussing on health care robot. Specifically, the editorial introduces the discussion about socially assistive robots,	Balistreri M., Casile F., I robot nella medicina, nella cura e nell’assistenza: una questione etica / Robots in healthcare and

	i.e., robots that can be used motivate people to perform physical exercises, engage them in conversation, check their health state, reduce their sense of loneliness, and so on. The article discusses what assistive tasks can be, in the future, assigned to a robot instead of a nurse: then, it addresses the problem whether assisted people will still be able to have a contact with other humans taking care of them, or the use of robots will unavoidably increase their sense of loneliness. The article concludes that it is necessary to prepare for this new technology without preconceptions-	assistance: an ethics issue. Introduzione al numero speciale "Carebot: i robot della cura e le questioni morali, psicologiche e sociali", NEU, ottobre 2018, pp. 1-4. https://iris.unito.it/retrieve/handle/2318/1684630/460481/M._Balistreri_F._Casile_a_cura_di_Carebo.pdf
4	The article addresses the forthcoming of socially assistive robots, as well as the possible ethical implication related to the use of robot in health and social care. In particular, the article observes that caregiving may have a negative impact on emotional, personal and social life of caregivers themselves, and robots may be an important resource for helping caregivers in performing their task. The article concludes that human caregivers will always have an important role: the only difference will be in the kind of job that will be performed by human caregivers when robots will take the most repetitive ones.	Balistreri M., Meglio un robot o una badante? La bioetica davanti alle domande del nuovo millennio / Is it better a robot or a caregiver? Bioethics and challenges of the new millennium. Endoxa, Year 5, No. 29, January 2021 (Google Scholar). https://endoxaidotnet.files.wordpress.com/2019/07/endoxa-luglio-2019-2.pdf
5	The article is based on some evidence of contemporary society. It starts from the so called «welfare crisis» and from some social changes such as population ageing and the progress in technology, which lead to a reflection on the future of the welfare itself. Within the frame of social innovation, the article, by focusing on the relationship between elderly society and the Ict (Information and Communication Technologies), introduces and discusses the role of voice-controlled digital assistants as an improvement to the living conditions of the older adults. Furthermore, the article highlights the need to calibrate new social policies aimed at elderly people, in order to redefine the welfare in accordance with the social investment approach and with the use of Ict by elderly people.	Grignoli D., Boriati D., Anziani, assistenti digitali e nuove politiche sociali / Elders, digital assistants and new social policies, Autonomie locali e servizi sociali, 2/2019 August, pp. 207-220, DOI: 10.1447/95865 Il Mulino (Google Scholar). https://www.rivisteweb.it/doi/10.1447/95865
6	The article discusses robotics and safety, one of the fundamental values in ethical analysis. In the field of robotics, risk analyses usually tend to pay attention to the hazards threatening the physical safety of people. However, there are hazards that affect psychological safety, today more than ever, given the spread of robots with social skills in the market. In this study, the authors analyze some of the possible psychological hazards arising from the use of social robots. If on one hand the technology is mature and the market ready to accept these robots, on the other hand the dangers, above all the	Salvini P., Le nuove sfide etiche della robotica. Robot sociali e pericoli psicologici / The new ethics challenges of robotics. Social robots and psychological dangers. Form@re. 2019, Vol. 19 Issue 1, p328-338. 11p (Google Scholar) https://core.ac.uk/download/pdf/228586746.pdf

	psychological ones, which could derive from interactions with social robots, are not entirely clear yet.	
7	The study reports an intervention study on a child with Autism Spectrum Disorder. The intervention was conducted using some activities included in the RE4BES protocol, a collection of guidelines for the implementation of educational robots' intervention for children and young people with special educational needs. To assess the efficacy of the intervention, an A-B-A quasi-experimental design was used, in which the involved child was repeatedly evaluated before, during and after treatment. The results showed that robotics activities produced significant changes in his fine motor skills, verbal and preverbal skills, social reciprocity and emotional expression. Furthermore, it was possible to observe a significant increase in the child's interest in the activity and in play skills.	Guastella D., D'Amico A., Paci G., Il protocollo re4bes per il potenziamento delle abilità cognitive, emotive e sociali di un bambino con disturbo dello spettro autistico / The re4bes protocol for empowering cognitive, emotional and social skills of a child with autistic spectrum disorders. Sistemi Intelligenti, Volume 32, Issue 1, 2020, Pages 123-137 (Google Scholar) https://www.rivisteweb.it/doi/10.1422/96284
8	The article presents a review of the literature produced over the last 10 years (2010-2019) on the use of robotics to develop social skills in the autism spectrum syndrome. The purpose of the analysis is to identify scientific evidence that, starting from the studies carried out on human-robot interaction in general, and on the interaction person with autism-robot specifically, they can help to understand if and how social robots can be used to support people with autism in the development of the Theory of Mind (ToM), by highlighting their potential and critical issues. In this perspective, the analysis of 35 significant contributions is presented, related to each other, to derive useful reflections in the preparation of future intervention protocols.	Pennazio V., Robotica e sviluppo delle abilità sociali nell'autismo. Una review critica / Robotics and development of social skills in autism. A critical review. Mondo Digitale, Volume 18, Issue 82, 2019 (Google Scholar) http://mondodigitale.aicanet.net/2019-3/Articoli/01_MD82_Robotica_e_sviluppo_delle_abilita_sociali_nell_autismo.pdf
9	The present article aims at reflecting on a number of empirical studies that the authors have carried out in the last five years with the purpose of retracing critically their research questions and results. The authors' reflection has pointed out two operational limits. The first consists in the fact that in these activities mainly build bots or use bots have been used, rarely social robots. The second limit is that poor effects have been achieved on changing the students' cognitive schemas on robots. These two limits raised the question whether they were peculiar to the authors' research or rather typical of common school activities. The answer is that they can be probably be ascribed to many educational robotics activities. Moreover, the authors identified two other issues: a structural limit, due to the often inadequate teacher training; and a design limit, due to an integration between curriculum subjects (including STEM disciplines) and social disciplines, which is insufficient to raise awareness about new social processes triggered by robotics. The authors think that there should be greater integration between these	Fortunati L., Ferrin G., Zuncheddu A., I Robot Sociali Visti come Strumento Educativo e Interrogazione Teorica / Social robot as educational tools and theoretical investigation. Sistemi intelligenti 1/2020, April, 155-165, 10.1422/96286, Il Mulino (Google Scholar) https://www.rivisteweb.it/doi/10.1422/96286

	different subjects to enhance cooperation amongst all the players involved in designing and conducting educational robotics activities. The authors suggest that it is desirable a correction of the general planning for the purpose of making explicit the social and cultural implications of the spread of robotics in everyday life, incorporating into educational robotics the awareness of its social meaning.	
10	The present article concentrates on one of the most relevant, and yet largely neglected, non-technical aspects of the introduction of social robots – its epistemological dimension. The focus is on two hypotheses, concerning the cognitive mind, that are recognized as highly influential on design, use and evaluation of social robots: the extended mind and the enactive mind hypotheses. Drawing on the related thematizations of the mind-technology relation, the article intends to illustrate how these hypotheses generate divergent theoretical and ethical approaches to human-robot social interactions, which can produce significantly different impacts on the arising mixed social ecologies. On this basis, the article emphasizes on the importance of supporting current research related to the "social sustainabilityμ of these new robots with a systematic, critical inquiry on the underlying epistemological assumptions, and promotes the establishment of a research line in epistemology dedicated to this task.	Damiano L., Mente, Robot ed Ecologie Sociali Miste; Mind, robots and mixed social ecologies. Towards an experimental epistemology of social robots. Sistemi Intelligenti, 1/2020 Aprile, pp. 27-39, DOI: 10.1422/96278 Il Mulino (Google Scholar). https://www.rivisteweb.it/doi/10.1422/96278
11	This paper focuses on children-robot interaction from the point of view of educational robotics. It proposes a new enactive robot assisted didactics approach, which applies the methodology of using the physical expressiveness of humanoid robots to a wider educational context by combining the enactive, participatory didactics approach with social robotic technology. It is proposed that this integration of social robots in education could help to increase the interconnectivity of the learning process by ascribing to robots a mediator function that strengthens the communication between teacher and children.	Lehmann H., Rossi P. G., Robot Sociali come Mediatori Educativi in Classe / Social robots as educational mediators in the lecture hall, Sistemi Intelligenti, 1/2020 Aprile, pp. 167-169, DOI: 10.1422/96278 Il Mulino. Google Scholar). https://www.rivisteweb.it/doi/10.1422/96287
12	The article raises the question whether the activity of software is a neutral one. The set of algorithms and big data which help the framework of an artificial intelligence in recognizing, classifying or elaborating data, could be considered truly objective? As a matter of fact, data are never objective: statistical models represent reality as they modify it. Furthermore, we are living in the era of learning machines: robots are everyday more intelligent, useful and independent from human control. As they are implied in a long list of activities, we need to know which rules they have to respect. Most of all, we need to establish who, and in what terms, could be responsible for their faults. That is	Amato Mangiameli A. C., Algoritmi e big data. Dalla carta sulla robotica / Algorithms and Big Data. The Rules and Principles of Robotics. Rivista di filosofia del diritto, 1/2019, June, pp. 107-124, DOI: 10.4477/93369, Il Mulino (Google Scholar). https://www.rivisteweb.it/doi/10.4477/93369

	why the European Union is elaborating a set of principles and rules on Robots and Artificial Intelligence: new technologies have a great potential for the benefit of humanity, provided that ethics and law do not give up on ruling them.	
13	Extensive international literature proved the important roles that humanoid and social robots can play in enhancing emotional, intellectual and social skills in people with autism spectrum disorder. The present study opens a new line of research in the international literature. In fact, it deals with the interaction between children with autism and non-humanoid and non-social robots; furthermore, the robot is not used for therapeutic but for cognitive purposes, as a tool to understand if, and under what conditions, the participants involved are able to attribute intentionality and mental states to inanimate objects. The presented study has a pilot and exploratory nature and involves qualitative observations of the motor and verbal behaviour of three participants with autism observing the behaviour of a non-humanoid and non-social robot programmed to avoid obstacles. The experiment was audio and video recorded by two cameras. The results described here, deriving from a qualitative analysis, suggest that the participants were able to attribute intentionality to the robot and provide ideas for future in-depth analysis.	Pucciarelli M., Virgulti L., Farina E., Datteri E., Robot non umanoidi e non sociali per lo studio dell'attribuzione di intenzionalità in bambini con autismo / Non-humanoid and non-social robots for the study of the attribution of intentionality in children with autism, Sistemi intelligenti, 1/2020, April pp. 107-122, DOI: 10.1422/96283, Il Mulino (Google Scholar) https://www.rivisteweb.it/doi/10.1422/96283
14	Experimental research confirms that using social robots with pre-school children as tutors for their learning has important positive effects in terms of children's learning and emotional involvement. In particular, the use of social robots for language learning (L1 and L2) leads to more learned words and a better memory of them. However, many technological limitations prevent from fully implementing the concept of embodiment, a distinctive feature of robotic technology compared to other computer-based technologies, and especially of gestures. In order to contribute to solve the problem, in a preliminary psychological test with Italian children learning English as L2, it was shown that appropriate modifications of the learning environment combined with a more limited use of gestures allow to achieve better results in terms of learning than a larger use of gestures in a less structured environment. If experimentally verified, these results would suggest the development of learning architectures which offer more affordances with respect to the task at hand, while implementing more limited forms of embodiment that are in line with current technological limitations.	Gasparini S., Robot sociali e insegnamento di L2 ai bambini: uno studio preliminare sull'embodiment della gestualità / Social robots and L2 teaching in children: a preliminar study on embodiment and gestuality. Form@re. 2019, Vol. 19 Issue 1, p47-59. 13p (Google Scholar). https://core.ac.uk/download/pdf/228585367.pdf

15	Information and Communication Technologies (ICT), particularly robotics and domotics, are progressively spreading in the contemporary society and their use is increasing in the field of geriatrics too. Even if the implementation of new technologies dedicated to older people is mainly aimed at caring for them and monitor their health, ICT can also sustain continuing learning and develop new practices of socialization. This paper reports the results of an explorative questionnaire survey conducted with a sample of older people who had some familiarity with technologies. Our aim was to investigate their perception about usability and their enjoyment of some online digital games/activities, analyzing the perceived potentialities of those devices for elders' socialization.	Zannini L., Mazzolatti D., Bernardelli G., Antonacci F.,. Borghese N.A, Daniele K., Valutazione di giochi/attività online da parte di un gruppo di anziani, in un progetto di robotica a supporto del loro vivere indipendente / Evaluating online games/activities by a group of elderly in a robotic experience aimed at supporting their independent living Form@re . 2019, Vol. 19 Issue 1, p312-327. 16p (Google Scholar) https://air.unimi.it/retrieve/handle/2434/657276/1260320/Anziani%20e%20giochi%20digitali%20per%20Form@re%20(finale,%20pubblicato).pdf
16	This article is inspired by the European Parliament Resolution of 16 February 2017 containing recommendations to the Commission concerning civil law rules on robotics The advent of Industry 4.0 has encouraged and enhanced the use of intelligent machines equipped with ever increasing degrees of autonomy. Robotics research, which today has reached very different levels of application, is preparing to become an object of widespread interest not only in production processes, but also for functionally differentiated social systems. In particular, the law is affected by the most advanced technological innovation and the application of Artificial Intelligence as robots, in the choices of the European Union, are the recipients of the attribution of ever greater responsibilities and rights. This raises problems, both of an ethical and a legal nature, hitherto unknown to the law and underestimated by politics and ethics. Observing this emerging phenomenon from the point of view of legal information technology allows us to describe the ways in which social systems evolve as a result of the irruption of new technologies into the legal system.	Di Viggiano P.L. , Etica, Robotica e Lavoro: Profili d'Informatica Giuridica / Ethics, robotics and work: profiles in legal informatics. DOI: http://dx.doi.org/10.12662/2447-6641oj.v16i22.p247-266.2018 https://periodicos.unichristus.edu.br/opiniaojuridica/article/download/1943/628
17	The article addresses the problem of "uncanny valley", that is the acceptance or non-acceptance of social robots that are performing important tasks in the society (teacher, doctor, nurse, specialized worker, etc.). The problem addressed in this article fits into the field of social robotics and of studies on media and communication. The main objective is to verify the occurrence of the phenomenon of the 'uncanny valley reaction', that is the low degree of acceptability that could be found in the presence of humanoid robots who carry out professions of high social importance. The second aim is to assess the perceived sense of security of people s the service offered by the robots varies. The third aim is to	Kruszewski T., I robot di servizio antropomorfi influenzano il nostro senso di sicurezza? Ai margini della riflessione sul futuro del mercato del lavoro nella LIS / Do anthropomorphic service robots affect people's sense of security? On the sidelines of the reflection on the future of the labour market in LIS AIB studi, AV. 60 N. 1, January/April 2020 (Google Scholar)

	determine the correlation between the different professional activities and the sense of anxiety felt by the users who receive the service. The data was collected through a survey conducted on a group of post-millennials by means of a questionnaire that evaluated images of humanoid robots, at various levels of similarity to humans, who held professional roles of high social importance: professor college, doctor, nurse, skilled worker, accountant, sales clerk. Statistical inferences were drawn based on the distribution of values and the chi-square test of independence. The study suggests that the uncanny valley reaction actually exists and that there is also a relationship between the level of trust and safety in the user and the type of work performed by the robot.	https://aibstudi.aib.it/article/view/12047
18	The article focusses on the integration of social and health services, in particular for independent living. Specifically, the article analyses some important factors that may play a key role in the process, including automation and the forthcoming of robotics for health and social assistance. The article describes expectations as well as the social, ethical, juridical, economic and political challenges that technological innovation will require to address.	Campedelli M., Nuovi scenari sull'integrazione sociosanitaria per le disabilità e le non autosufficienze / New scenarios on social- and health- integration for disability, Ricerca & Pratica, Vol. 35, No. 3, DOI:10.1707/3159.31400, May-June 2019 (Google Scholar). https://www.ricercaepratica.it/archivio/3159/articoli/31400/
19	The study analyses the impact of robotics and artificial intelligence on the civil liability system, with particular reference to the health sector, discussing whether it is necessary to introduce an ad hoc legislative discipline, as recommended by the Resolution of the European Parliament which in 2017 invited the Commission to dictate new rules, or whether the current legislation already offers an adequate structure to provide protection against damage caused by devices and robots, also in the medical field.	Di Gregorio V., Robotica e intelligenza artificiale: profili di r.c. in campo sanitario / Robotics and Artificial Intelligence: profiles in health care. Responsabilità Medica, Diritto e Pratica Clinica https://www.rivistaresponsabilitamedica.it/robotica-intelligenza-artificiale-profili-r-c-campo-sanitario/
20	The analysis aims to examine some of the legal consequences stemming from the spread of technological innovation in the health sector, having regard to the unequal distribution of resources on a regional basis. The final addendum is focused on the lessons to be learned from the dramatic challenge of the SARS-CoV-2 virus pandemic that Italy and the entire world are currently facing.	Bella A., F., L'accesso alle tecnologie innovative nel settore salute tra universalità e limiti organizzativi (con una postilla sull'emergenza sanitaria) / Access to innovative technologies in the health care sector – universality and organizational limitations, P.A., Persone e Amministrazione, No. 1, 2020, http://dx.doi.org/10.14276/2610-9050.2204 (Google Scholar). http://ojs.uniurb.it/index.php/pea/article/view/2204

21	The aim of this paper is twofold. Firstly, authors run a logit model on a dataset of professions identified according to the fifth digit of Istat cp2011 nomenclature in order to estimate their probability of being "substituted" by robots and artificial intelligence. In that, each profession is classified according to three degrees of substitution: low, medium and high. Secondly, by using data provided by the Italian Labor Forces Survey, the authors exploit the main characteristics of those professions with high risk of technological displacement. Interesting findings emerge from the analysis. On one hand, jobs requiring creative and social skills are less replaceable compared to those that are manly based on routinely mansions. On the other hand, jobs with high probability of being substituted are associated with both lower levels of instruction and age. Such results provide an empirical contribution to the flourishing debate about the quantitative and qualitative occupational effects of technological progress as well as important policy implications.	Caravella S., Menghini M., Race against the Machine. Gli effetti della quarta rivoluzione industriale sulle professioni e sul mercato del lavoro / Race against the Machine. The effects of the fourth industrial revolution on the professions and on the labor market, 1/2018, January-March, DOI: 10.1430/90437. https://www.rivisteweb.it/doi/10.1430/90437
	Books	
22	The book aims at helping professionals and workers to understand and prepare themselves to cope with the impacts of the unprecedented technological innovation due to the forthcoming of robots. The book argues that those who purposely ignore or underestimate the impact of this innovation will be overwhelmed: for this reason, it is necessary to be understand the direction in which the world is going and adapt themselves to the forthcoming of these new technologies.	Simbula C., Professione Robot 2.0: Scopri i lavori che i robot faranno al posto tuo. E se una macchina verrà a sostituirti, saprai come difenderti / Robot 2.0: Discover jobs that robots will do in your place. If a machine will try to substitute you, you will know how to defend yourself. Ledizioni, 2018 (Google Scholar) https://www.ledizioni.it/prodotto/professione-robot-2-0/
23	Our era is characterized by a new great transformation, driven by unprecedented technological innovation, digitalization processes, artificial intelligence and robotics, which overwhelm traditional business models and, in general, every aspect humanity. The book addresses how to cope with a change that also requires new forms of leadership as well as a new governance capable of ensuring the integral development of the person and the search for the common good. What implications will this have on work and its organization, on employment and on human-machine relations? Will it be a coexistence between allies or between rivals?	Gabriele Gabrielli, Il lavoro dell'uomo con i robot. Alleati o rivali? / Human work with robots. Allies or rivals? Franco Angeli, 2020 (Google Scholar). https://www.francoangeli.it/Ricerca/scheda_libro.aspx?Id=26232

24	As always in history, machines replace humans and innovations increase productivity. But this time, in a globalized and hyper-connected world, there is the fear of growth without new work and not respectful of environmental, social, demographic, food and energy constraints. The book is a profound reflection on the concept of sustainability. The author believes that a more balanced growth is possible and refuses the apocalyptic alarmism on the destiny of work: he identifies jobs at risk but also new professions; he analyzes alternative growth models and compares different socio-economic strategies, from working hour reduction to robot tax, from citizenship work to universal income; he formulates the innovative endowment capital and share dividend proposals, which will cause much discussion. To avoid unsustainable growth and the lacerating human-machine conflict, innovations must be used to improve human life: he suggests that we shall invest without fear in school and training, rediscover the identity and social value of work, meet the needs of the present generations without burdening future ones, preserve the health of the planet, ensure that many can benefit from the wealth produced. The goal is to govern epochal change by establishing an intelligent coexistence with machines. Among the "new professions" there could be above all one, very ancient: the man-shepherd. Robots.	Magnani M., Fatti non foste a viver come robot. Crescita, lavoro, sostenibilità: sopravvivere alla rivoluzione tecnologica (e alla pandemia) / You were not made to live as robots. Growth, work, sustainability: how to survive to technological revolution (and to pandemics) UTET, 2020 (Google Scholar). https://www.utetlibri.it/libri/fatti-non-foste-a-viver-come-robot/

GREY LITERATURE

NATIONAL

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in IT. Short descriptions are provided below, as are links and/or PDF files. **Years: 2018-1/2021**		
	Title/ Summary	**Reference/Link**
	Online magazines	

1	The following article aims to describe the evolution of the nursing profession, highlighting the steps that led to the full responsibility of nursing and highlighting the evolution of the profession in the technological field, by pointing out the advantages and disadvantages of the latter. The main question that the article addresses is: "Can robots replace the figure of the nurse?". To reply to this question, the article explores pros and cons of AI and Robotics technology from a nurse perspective, also considering the attitude towards new technologies in different countries. The article concludes that robots may play an important role in many tasks, but they will not be able to substitute humans in care because of the lack of emotions and then empathy with the person.	Redazione di Nurse Times, Empatia o Tecnologia / Empathy or Technology. Nurse Times, March 2019 https://www.nursetimes.org/empatia-o-tecnologia/65387
2	The article observes that the so-called fourth industrial revolution will sweep millions of jobs. For several years now, experts and journalists have been documenting the consequences of a continuous automation of the world of work: consequences that some paint as idyllic, others as apocalyptic. In this general scenario, the article opens the debate if robot nurses shall be preferred to human ones. It observes that any employer (be it a private individual or the State), in achieving the required results, between a real nurse and a hypothetical and perfect automaton-nurse will choose the one that will cost him less and that it will give him fewer problems. However, the article concludes that - from recent analyses - robots to date can at best support nursing activities.	Tobruk D., Robot Infermieri: chi ruberà il lavoro agli infermieri? / Robot nurses: who will steal the job of nurses? Dimensione Infermiere, January 2021 https://www.dimensioneinfermiere.it/robot-infermieri/
4	The article argues how the use of robot nurses can improve the working conditions of hospitals during the Covid-19 pandemic, provided however that you identify the operations that it can perform, being careful not to lose the human dimension of the relationship between healthcare professional and patient which is fundamental in the treatment process.	Marino D., Robot infermieri nella lotta al Covid-19: vantaggi e limiti della tecnologia / Robot nurses in the fight against Covid-19: advantages and limitations of technology. Agenda Digitale, April 2020. https://www.agendadigitale.eu/sanita/robot-infermieri-nella-lotta-al-covid-19-vantaggi-e-limiti-della-tecnologia /
5	The areas of application of robots in the healthcare sector are constantly increasing: From their use in surgery to staff training. The article observes that their contribution is essential and will be increasingly so in the future, when it comes to solving practical problems in health care: however, there are security and data protection risks. The article raises the issue of an adequate framework for the challenges ahead.	Lacava G., Marotta A., Martinelli F., Robotica sanitaria, si gioca sulla security una partita da 12 mld di dollari / Healthcare robotics, we are playing a match of 12 million dollars on security. Sicurezza Digitale, August 2020.

		https://www.agendadigitale.eu/sicurezza/robotica-sanitaria-si-gioca-sulla-security-una-partita-da-12-mld-di-dollari/
6	The article discusses the use of robots in severe epidemic events, such as the current Covid-19 pandemic. Robots don't wear a mask and gloves, they never get tired, they don't risk getting infected by patients. During the pandemic, robotic technology has enabled many hospitals to take care of the sick more safely and, very often, more efficiently. We have seen it also in some Italian facilities, such as the now famous Tommy of the Varese hospital: it is a human-like instrument that allows patients to be monitored; a mobile computer that moves between departments and wards, and requests the intervention of health personnel in case of anomalies. For doctors and nurses it is a great help in a phase of overload of work like the one that has been going on for almost a year now: the robots do not feel tired, at most they discharge the batteries. In addition, there is the enormous economic, environmental and logistical advantage of not having to "dress" Tommy and other robots with personal protective equipment, such as masks, gloves and protective gowns. Because obviously they are not subject to infection by patients. In this way, the robots allow doctors to communicate with patients remotely, without taking risks themselves. The article concludes that the relationship between healthcare personnel and patients still shall remain at the center of everything: this shall not be replaced, and will absolutely not be overshadowed by the multiplication of robotic assistants. Indeed, for infectious disease patients who must remain in quarantine, isolated for several days, human contact - after all the necessary precautions - becomes even more important.	Future M., Automazione - I robot nel futuro dell'edilizia e della sanità / robots in the future of constructions and healthcare. https://www.linkiesta.it/2021/02/i-robot-nel-futuro-delledilizia-e-della-sanita/
7	The article discusses the attitude of Italians towards new technologies, by highlighting that they express substantial confidence in the possibilities of using them to improve health (including artificial intelligence), as long as humans remain at the center of the system. This is the sentiment revealed by an Ipsos survey presented at the 16th edition of "The Future of Health", the annual event of ab medica - a leading Italian company in the production and distribution of medical technologies, including surgical robotics. The theme of the conference is the cancer care network as a model of care for patients with cancer: the different areas of oncological networks, from telemedicine to surgical robotics, from genomics to radiotherapy, have been analyzed by the IPSOS research,	P. Benini, Robotica e AI possono migliorare la sanità, ma non sostituire il medico / Robotics and AI can improve healthcare, but not substitute doctors. Medico e Paziente, Medico e paziente, November 2019 https://medicoepaziente.it/2019/robotica-e-ai-possono-migliorare-la-sanita-ma-non-sostituire-il-medico/

	whose results are summarized and discussed in the article.	
8	The article discusses how the digitalization and re-engineering of healthcare processes are creating the basis for robotics and artificial intelligence to truly impact healthcare in all clinical, diagnostic and support processes. Enabling technologies will revolutionize healthcare as we know it today. The recent COVID-19 pandemic highlighted the enormous benefits of AI and robotics for countries that had already invested in such technologies such as China. All industry studies show that the adoption of AI on cloud platforms, thanks to mobile computing, will completely revolutionize the relationship between healthcare facilities and patients. The article frames the recent technological developments for health management in the so-called Health 4.0: from rehabilitation techniques using exoskeletons, to access to new predictive knowledge thanks to data from digital medical records, from the use of robots in the creation of chemotherapies , to early diagnosis with computer vision.	D. Majidi, Robotica e Intelligenza Artificiale Applicata al Settore Sanitario / Robotics and Artificial Intelligence applied to the Healthcare sector. Artes 4.0, July 2020. https://blog.artes4.it/robotica-e-intelligenza-artificiale-applicata-al-settore-sanitario
9	The rapid spread of robotics in the workplace and home life multiplies the interactions between man and robot and makes it necessary to establish constraints within which safety and ethics are respected. The first aspect that needs to be clarified in the legislation is that of responsibility: to whom to attribute it, both in terms of civil and criminal law, when the interlocutor is a robot? The Industry 4.0 revolution has opened the doors to robotic automation in the production sectors, amplifying the complexity of the system and highlighting an infinite number of regulatory gaps. How to manage coexistence with a cobot (neologism indicating a humanoid colleague) in the workplace so that it is not critical for human safety? Robots will replace humans not only in carrying out operational tasks, but also in independent decision making for the aspects provided for in their design. How to protect human safety in the field of action of industrial humanoids? The questions that arise from the reflections around the industrial applications of robotics accumulate without finding an answer, because innovation proceeds at a speed incompatible with that of the law-making processes.	M. Torriani, L'utilizzo dei robot collaborativi in sanità / Using healthcare robots in healthcare 01health, August 2019. https://www.01health.it/tecnologie/robot-collaborativi-sanita/
10	The article includes an interview to Prof. Maria Chiara Carozza, Italian Ministry of University and Education, about Healthcare 4.0, including the use of Socially Assistive Robots.	F. Pezzella, Robotica e sanità 4.0: intervista alla Professoressa Maria Chiara Carrozza / Robotics and healthcare 4.0: interview to the Prof. Maria Chiara Carozza

		https://www.ingv.it/it/newsletter-ingv-n-7-settembre-2020-anno-xiv/robotica-e-sanita-4-0-intervista-alla-professoressa-maria-chiara-carrozza
11	The article addresses the problem of civil liability for the damage that robots might cause to people, by observing that the problem of robot awareness belongs to science fiction, however the civil liability for the damage they could cause to people belongs instead to the present in which we live. According to the author, three certainties have prompted the European Parliament to ask the Commission to express its opinion on the issue with some urgency. One: robots, sensor systems and artificial intelligence will disrupt lifestyles, transport, production and social and health care. And 2017, as will be seen below, is at the dawn of this transformation that is already underway. Two: the civil liability regulations are grossly inadequate to address the damage caused by these machines to people. Three: the ability of machines to modify their programming and make autonomous decisions based on experience raises the possibility, far from paradoxical, of having to divide civil liability in the future for any errors between men - producers , programmers, operators etc. - and the machines themselves. Without being able, so far, to define exactly who is to blame if a robot is wrong. The article argues that the speed of diffusion of these technologies and the fields of application, healthcare in the first place, makes these issues extremely important, and try to address them.	A. Guerrieri, I ROBOT E LA RESPONSABILITÀ CIVILE IN SANITÀ: IL GRANDE IGNOTO 7 Robots and civil responsibility in healthcare: the big unknown. Sanità 360, May 2018. https://www.sanita360.it/2018/05/08/i-robot-e-la-responsabilita-civile-in-sanita-il-grande-ignoto/
12	The study analyses the impact of robotics and artificial intelligence on the civil liability system, with particular reference to the health sector, discussing whether it is necessary to introduce an ad hoc legislative discipline, as recommended by the Resolution of the European Parliament which in 2017 invited the Commission to dictate new rules, or whether the current legislation already offers an adequate structure to provide protection against damage caused by devices and robots, also in the medical field.	V. di Gregorio, Robotica e intelligenza artificiale: profili di r.c. in campo sanitario 7 Robotics and Artificial Intelligence: profiles of civil responsibility in the healthcare robotics. Responsabilità Medica, Diritto e Pratica Clinica https://www.rivistaresponsabilitamedica.it/robotica-intelligenza-artificiale-profili-r-c-campo-sanitario/
13	The article explores a public domain issue, whether automation and robotics will put millions of jobs at risk. A common experience is the slow and continuous disappearance	D. Tobruk, Robot Sanitari: non possono (ancora) sostituire gli infermieri / Healthcare robots: they cannot substitute nurses

	of toll booths from motorways and cashiers from supermarkets, both replaced by impenetrable and austere automatic cash machines. For nurses, on the other hand, what do you expect? Is their place also at risk? Will health robots clear nurses' wards? The article surveys the opinion of experts in the field and concludes that health robots may help nurses in wards but cannot (yet) replace them. According to early studies, to date, the possibility of being replaced by machines and AI is really rare. All the most advanced prototypes of "robot nurses" actually have an operational level comparable to a first-experience auxiliary worker.	(yet). October 2019 https://www.dimensioneinfermiere.it/robot-sanitari-non-possono-sostituire-gli-infermieri/
	Conferences	
14	Digitization technologies, biotechnologies, robotics and artificial intelligence (in support of and not substitution of humans), have taken an incisive role in the field of health. The conference intends to offer food for thought on a highly important issue, i.e., the development of robotics and artificial intelligence as global actors of transformation and change in social life, which will increasingly have a profound impact on people and on every area of human activity. The conference particularly address the impact that these technologies have already produced and/or will shortly produce on healthcare: if, on the one hand, there will be the replacement of human capital with robotic and mechanical capital in many sectors, on the other hand cultural impact and the training of young people will play a crucial role in addressing the challenges posed by new technologies.	Robotica e Intelligenza Artificiale in Sanità. Innovazioni e Opportunità / Robotics and Artificial Intelligence in healthcare. Innovation and opportunities. Conference organized by AUSL of Ferrara, Health Service of Emilia-Romagna https://www.ausl.fe.it/home-page/robotica-e-intelligenza-artificiale-in-sanita-innovazioni-e-opportunita
15	The report addresses the problems to be faced in the future, that follow the more and more pervasive role of technology. As the World Economic Forum notes, technology is the most important agent of change of the modern era. For this reason, understanding its evolutionary dynamics opens up to a better understanding (and anticipation) of the future to come. The technological areas that will shape our near future are expected to be the following: 5G, AI + Data, Blockchain, Innovative manufacturing, Assisted driving technologies, New generation electric batteries, New materials, Genetic engineering and the enhancement of the human body, Robotic technologies. In this general scenario, the report focusses on the role of leadership, and the skills that will be required to be the leader of teams composed of humans and robots.	A. Granelli: Di che leader avremo bisogno per guidare uomini e robot? / Which leaders will we need to lead humans and robots? Atti del VI Seminario Interdisciplinare sull'Accoglienza "Persona, lavoro e innovazione. Con o contro l'economia dei robot", 2019 http://www.agranelli.net/DIR_rassegna/ART_LavoroPersona_2019.pdf
	Projects	
16	The report describes ongoing work in the context of the UPA4SAR Italian National Project	C. Di Napoli, S. Rossi, Robot Sociali per l'Assistenza Domiciliare

	(PRIN2019), focussing on home assistance and personal rehabilitation through Social Robots.	e la Riabilitazione Personalizzata e Adattiva / Social Robots for home assistance and personalized rehabilitation. Technical Report, University of Naples, 2019. http://www.upa4sar.unina.it/pub/ital-ia19PRIN.pdf
	Policies	
17	There is a fourth Industrial Revolution happening, but it still does not represent a fundamental breakthrough now. The acceleration of progress in the fields of ICT, robotics, artificial intelligence and new digital technologies are changing the economics dogma that technological development enhances wealth and life standard of a country. A recent literature on the possible consequences for employment deriving from the widespread use of such technologies, claims that compared to previous industrial revolutions, this time might be different. This paper shows the literature analysis on future impacts that the progress of new digital technologies, of artificial intelligence and of robotics in particular will have on the occupations and skills of workers.	S. Lovergine, A. Pellero, Quale futuro per il lavoro: analisi della letteratura sugli impatti della robotica / What future for work: analysis of the literature on the impact of robotics. Inapp (Istituto Nazionale Analisi Politiche Pubbliche), 2019 http://oa.inapp.org/bitstream/handle/123456789/386/INAPP_Lovergine_Quale_Futuro_Per_Il_lavoro_2019.pdf?sequence=4&isAllowed=y
18	The report makes prediction for the next future about the concept of work due to progress in ICT, Robotics, and AI, as well as the required policies to deal with changes in the Society.	S. Lovergine, Questa volta è diverso? AI, nuove tecnologie digitali e futuro del lavoro / Is this time different? AI, new digital technologies and future of work. Inapp (Istituto Nazionale Analisi Politiche Pubbliche) , 2019 http://oa.inapp.org/bitstream/handle/123456789/420/INAPP_Lovergine_AI_Nuove_Tecnologie_Digitali_2019.pdf?sequence=2&isAllowed=y
19	The report analyses the state of the Italian National Health Service concerning technological innovation, by describing some case study that appear to be particularly relevant. In doing this, the report identifies five mean contexts for innovation, including the role of AI and Robotics. The objective of the report is to promote the debate on how to manage these new technologies as they are adopted in healthcare systems and. More precisely, the study was achieved by adopting an exploratory approach aimed at intercepting extremely innovative technologies already in use in some health facilities, also in Italy. These are not strictly health-related innovations, as they do not require a regulatory approval in order to be used, but can generate profound changes in service, with impacts on patients, their families	P.R. Boscolo, L. Fenech, V. Rappini e A. Rotolo, Tecnologia e innovazione nei modelli di servizio in sanità / Technology and innovation in service models in healthcare. Rapporto OASI 2019, Osservatorio sulle Aziende e sul Sistema sanitario Italiano, CERGAS – Bocconi, 2019 https://www.cergas.unibocconi.eu/wps/wcm/connect/deec6ca1-0867-43a8-a3ad-3278d82d86d5/Cap14OASI_2019.pdf?MOD=AJPERES&CVID=mWPIn5G

	and, last but not least, on professionals. In summary, the report aims to: explore what are the areas in which the technologies are generating a major change in service models; highlight the factors facilitating the adoption and implementation of these innovations, and the possible impacts of technologies on processes, professionals and end users. The goal and the main interest of this research is to promote the debate on the importance of an active strategy approved for the management of technologies.	
	Theses	
20	The thesis analyses the interaction between social robots and human beings, including the possibility for the latter to have a false representation of reality through the interaction.	R. Carli. Robot sociali e interazione con l'uomo: il problema dell'inganno / Social robots and interaction with humans: the problem of deceiving. Master Thesis, February 2020. https://etd.adm.unipi.it/t/etd-01152020-123224/
21	The thesis focusses on the role of nurses in surgery rooms, with a particular emphasis in scenarios of robotic surgeries.	C. Scollo, Evoluzione e complessità di un ruolo: l'infermiere nella chirurgia robotica / Evolution and complexity of a role: nurses in robotic surgery. B.S. Thesis, 2019, Università di Messina (Google Scholar). http://cab.unime.it/tesi/4161/
22	The thesis focusses on the role of nurses in surgery rooms, with a particular emphasis in scenarios of robotic surgeries.	V. Lo giudice, Infermiere strumentista: ruolo e competenze in chirurgia tradizionale e robotica / Nurse and instrumentalist: role and competences in traditional and robotic surgery. B.S. Thesis, 2019, Università di Messina (Google Scholar). http://cab.unime.it/tesi/4097/
23	The thesis focusses on the role of nurses in surgery rooms, with a particular emphasis in scenarios of robotic surgeries.	D. Catanzaro, Strumentista robotico, l'infermiere tra high-tech e high touch / The robotic instrumentlist, the nurse between high-tech and high-touch. B.S. Thesis, 2018, Università di Messina (Google Scholar). http://cab.unime.it/tesi/4255/
24	English Summary. The thesis analyses the impact of technological innovation in hospital settings.	A. Arzenton, Innovazione tecnologica e nuovi lavori nel settore medico-ospedaliero / Technological innovation and new jobs in the medical-hospital sector. B.S. Thesis, Università degli

		Studi di Padova, 2019 (Google Scholar) http://tesi.cab.unipd.it/63943/1/Arzenton_Anna.pdf
25	The thesis analyses the impact of technological innovation on healthcare workers.	P. Gubita I Lavori Ibridi in sanità / Hybrid works in healthcare. B.S. Thesis, Università degli Studi di Padova, 2019 (Google Scholar) http://tesi.cab.unipd.it/63346/1/Brazzale_Marco.pdf

ROMANIA

PEER REVIEWED ARTICLES

NATIONAL

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in RO. Short descriptions of each article are provided as are links and/or PDF files.
Years: 2018-1/2021

	Summary	**Reference/Link**
1.	The article describes two examples of integrated care services that are using assistive technologies in innovative ways to assess and deliver of timely interventions for poly	Ionut Anghel et al., Smart Environments and Social Robots for Age-Friendly Integrated Care

	pharmacy management and for social and cognitive activity support in older adults.	Services. *Int. J. Environ. Res. Public Health* 2020, *17*(11), 3801; https://doi.org/10.3390/ijerph17113801 https://www.mdpi.com/1660-4601/17/11/3801
2.	A narrative review that summarizes the available evidence in the literature on artificial intelligence (AI) methods that have been applied during robotic surgery	Iulia Andras et al., Artificial intelligence and robotics: a combination that is changing the operating room *World J Urol*, 2020 https://doi.org/10.1007/s00345-019-03037-6

GREY LITERATURE

NATIONAL

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in RO. Short descriptions are provided below, as are links and/or PDF files. **Years: 2018-1/2021**		
	Title/ Summary	**Reference/Link**
1.	**National Strategy for Intelligent Research, Innovation and Specialization 2021-2027 (SNCISI)** Like other European countries of relatively large size, Romania has and will have in the programming period 2021-2027 both regional strategies of smart specialization and a national component of smart specialization, which will be subsumed to the National	UEFISCDI, 2020 https://uefiscdi.gov.ro/resource-821456-raport-consultare-exploratorie__201009.pdf

	Strategy for Research, Innovation and Smart Specialization 2021-2027 (SNCISI). This is the Report of the online exploratory consultation on smart specialization at national level.	
2.	**Medical Robotics** The Course support presents aspects related to the role of medical robots; simulation and control of medical robots, methods and techniques used in modeling, simulation and control of medical robots, socio-economic implications related to the use of medical robots, aspects related to the advantages of using parallel robots as medical robots.	Prof. Dr.Ing. Doina PISLA, 2012 https://cester.utcluj.ro/lectures/Robotica_Medicala/ROB_MED_C1_Pisla.pdf
3.	***Artificial Intelligence in Medicine - course curriculum*** The first AI course in medicine in Romania within the medical university, Grigore T Popa University of Medicine and Pharmacy Iasi, 2020 / 2021.	Medical University, Grigore T Popa University of Medicine and Pharmacy Iasi, 2020 https://www.umfiasi.ro/ro/academic/programe-de-studii/licenta/Documents/2020-2021/Optionale/MRO/An%205%20-%20Inteligen%C8%9Ba%20Artificial%C4%83%20%C3%AEn%20Medicin%C4%83%20%E2%80%93%20curs%20introductiv.pdf?fbclid=IwAR2TH-Y3UQp6KE2hOangGxqnWMGnhoH2BeM9vW3K4YHhthum8kT5TNEwpxM
4.	***How are robots used in medicine?*** Since the first cases of COVID-19, various robots have been used around the world to perform a variety of tasks: to disinfect hospitals and public spaces with ultraviolet light, to take patients' temperature and blood pressure, to transport samples. harvested in laboratories, to provide food for those in quarantine, etc. In many cases,	Valentina Nicolae , 2020 https://mindcraftstories.ro/roboti/cum-sunt-folositi-robotii-in-medicina/

	these robots already existed - either as a prototype that was adapted to serve medical purposes, or as aids in hospitals. Locally, Bucharest Robots, a Romanian robotics startup, donated a disinfection robot to the "Matei Balş" National Institute of Infectious Diseases. Modulab, a research and development laboratory in Bucharest, also joined the fight against COVID-19. They produced an autonomous robot to disinfect hospitals, MUV Smart.	
5.	**Medicai startup, artificial intelligence treatment for medicine** Medicai project (https://medicai.io/) aims to make medical imaging collaboration easy for patients, doctors, clinics & hospitals, enables patient-doctor collaboration, through online sharing and communication.	Vlad Andriescu, 2020 https://start-up.ro/startup-ul-medicai-tratamentul-prin-inteligenta-artificala-pentru-medicina/
6.	**Timisoara-based XVision makes the first implementation of an AI-based healthcare platform in a Romanian public hospital** **XVision**, is an AI-based platform for analyzing lung X-rays: 20% more lung X-rays can be interpreted daily with the help of XVision, the application signalling those with pathologies and prioritizing them for visualization by radiologists. The application will be further developed to provide data for upper and lower limb X-rays.	Claudiu Zmfir, 2020 https://www.startupcafe.ro/smart-tech/startup-inteligenta-artificiala-medicina.htm

UK

PEER REVIEWED ARTICLES

NATIONAL

Description: The information below relates to peer reviewed articles concerning current understanding relating the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in UK. Short descriptions of each article are provided as are links and/or PDF files.
Years: 2018-1/2021

	Summary	Reference/Link
1	This study followed a mutual shaping framework (exchanging knowledge and ideas between researchers and participants). A participatory design approach was used. Focus groups were held with therapists, including discussions about potential consequences and opportunities with respect to the use of robots in the context of therapy. They also saw a demonstration of the socially assistive robot Pepper. Using the findings, the authors have made some recommendations about how similar approaches of participatory design and mutual shaping can be used by other researchers.	Winkle, K., Caleb-Solly, P., Turton, A., Bremner, P. (2020). Mutual shaping in the design of socially assistive robots: a case study on social robots for therapy. *International Journal of Social Robotics,* 12, 847-866. https://link.springer.com/article/10.1007/s12369-019-00536-9

GREY LITERATURE

NATIONAL

Description: Reports published that address the views – attitudes – needs of nurse/health/social professionals to work with socially assistive artificially intelligent robots in health and social care environments in UK. Short descriptions are provided below, as are links and/or PDF files.
Years: 2018-1/2021

	Title/ Summary	Reference/Link
1	**Robotics and autonomous systems strategy: government response** This letter is from the science minister of the UK Government at the time, Greg Clark, to Professor David Lane and Professor Rob Buckingham who were the chairs of a	Cabinet office (2015). Open letter: response to the robotics and autonomous systems strategy.

	special interest group called RAS which in 2014 gave some recommendations for stimulating growth in Britain's robotics and autonomous systems industry. This letter outlines each recommendation and the government's response to each one.	https://www.gov.uk/government/publications/robotics-and-autonomous-systems-strategy-government-response
2	**Robotics and artificial intelligence** This committee undertook an inquiry into robotics and AI, addressing problems, challenges and needs for preparation for the increasing use of these technologies in the UK. The report highlights the economic and social implications of using AI (increased productivity and changes to jobs and the workforce), ethical and legal issues, as well as implication for funding and innovation. It ends with some specific recommendations of how the government can prepare for the use of AI. They recognised that changes to jobs will necessitate new skills and training, and therefore recommended that the government should be ready to support re-skilling and upskilling on a continuous and flexible basis, depending on the needs of the workforce. They recommended that there should be a digital strategy to address the digital skills crisis.	House of Commons Science and Technology Committee: Robotics and artificial intelligence. (2016). Fifth Report of session 2016-2017. https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/145/145.pdf
3	**Robotics and artificial intelligence** Key points from this report: -AI and robotics are different and may develop at different rates -As jobs change, and demand for skills change, there may be new employment opportunities created. -AI technology can improve productivity. Robotics could stand in for jobs that are dangerous or difficult for humans to do.	Royal Academy of Engineering (2016). Robotics and artificial intelligence. A response to the House of Commons Science and Technology committee inquiry into robotics and artificial intelligence. https://www.raeng.org.uk/publications/responses/robotics-and-artificial-intelligence

	-The government should support in reskilling or upskilling the workforce.	
4	**Robotics and autonomous systems- visions, challenges and actions** This report summarises discussions that took place at a 2015 conference organised by the Royal Society on the subject of Robotics and Autonomous systems (RAS). It describes the state of the art of Robotics and Autonomous systems in 2015 and describes different applications of these in society and industry, for example, in healthcare. Challenges regarding robotics and autonomous systems are also described. One such challenge is the need for a skills base for the use of these technologies.	Royal society (2016). Robotics and autonomous systems- visions, challenges and actions. Conference report. https://royalsociety.org/science-events-and-lectures/2015/11/robotics-and-autonomous-systems/
5	**Automation and the Workforce** This note describes specific ways in which Robotics and autonomous systems (RAS) may impact on employment and the workforce. They can either take over tasks that have been done by human workers or help human workers to do tasks that cannot be automated. It is likely that these new technologies will create more jobs, or change the types of jobs people do, and by implication, change the skills that are needed. This may drive job losses and the impact may create inequalities, depending on the demand for certain jobs and certain types of skills. The report also mentions education and training, due to the rate of technological change (and therefore the need for up-skilling or re-skilling). It mentions several suggestions that have been given to address these needs: MOOCs, on-the-job training, and links between businesses and educational institutions so that they can deliver targeted training based on business needs.	UK Parliament POST – POSTNOTE Automation and the workforce (2016). https://post.parliament.uk/research-briefings/post-pn-0534/
6	**Growing the artificial intelligence industry in the UK** This was an independent review carried out by Professor Dame Wendy Hall and	Hall, W. and Pesenti, J. (2017) Growing the artificial intelligence industry in the UK.

	Jerome Pesenti, commissioned by the government's Business Secretary and Culture Secretary at the time. The report makes a number of recommendations about what the UK government can do in order to assist with the growth of AI and maintain the UK as one of the 'world leaders' of AI. The report includes specific recommendations about improving the supply of skills. These recommendations included education across different settings, from school (learning skills in STEM) to undergraduate level, postgraduate level (Masters and PhD), academic fellowships, as well as MOOCs and continuing professional development (CPD) courses.	https://www.gov.uk/government/publications/growing-the-artificial-intelligence-industry-in-the-uk
7	**Improving digital literacy** This report outlines the plans for the NHS to improve digital literacy. The Royal College of Nursing and Health Education England are working in partnership to deliver this. The report defines digital literacy and outlines some domains in which it is used. Challenges and solutions are presented, along with details of programmes that are being implemented in order to improve digital literacy, for example Health Education England's digital literacy project.	Health Education England and Royal College of Nursing (2017). Improving digital literacy. https://www.rcn.org.uk/professional-development/publications/pub-006129
8	**Robotics and artificial intelligence** This report lays out the government's response to the House of Commons report of session 2016-17 concerning Robotics and Artificial Intelligence. Some key parts of this document: -the government agrees that there is a need for strategic co-ordination and leadership regarding Robotics and Autonomous systems (RAS). -the government says it is working with industry, education and training bodies to	House of Commons Science and Technology Committee (2017) Robotics and artificial intelligence: Government Response to the Committee's Fifth report of Session 2016-17. https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/896/896.pdf

	reduce skills gaps and address shortages. It says it is going to make changes in primary education through to further education. It is also investing in other forms of training such as digital skills qualifications and PhD training. It is also going to seek input from industry experts and specialists to help shape action on digital skills, and gives an example of the changes to the Apprenticeship standards.	
9	**Building a Britain fit for the future** The government's White paper on its industrial strategy names two grand challenges that are of particular relevance to this project: AI and data economy, and Ageing society. The government intends to invest in AI and also to use innovation to help meet the needs of an ageing population. The government has five areas of productivity, one of which is 'people'. This includes investment in the education system and in retraining so that people are able to obtain skills that will prepare them for better jobs.	HM Government (2017). Industrial strategy: Building a Britain fit for the future. White Paper. https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future
10	**Managing automation: Employment, inequality and ethics in the digital age** Key conclusions of this report that are relevant to this project: -Automation is likely to change jobs rather than eliminate them. -The tasks that human workers do are likely to change, as well as the percentage of their job that is automated. -There are likely to be inequalities introduced because there is no large-scale policy intervention relating to the roll-out of automated technologies. The report also gives a number of recommendations, for example about managing the implementation of automated technology, and also in relation to the regulation	Institute for Public Policy Research Commission on Economic Justice. (2017). Managing Automation. Employment, inequality and ethics in the digital age. Discussion paper. Mathew Lawrence, Carys Roberts and Loren King. https://www.ippr.org/publications/managing-automation

	of AI and robotics.	
11	**Why the NHS is still struggling to make the most of new innovations** This briefing, outlines some of the key challenges and barriers for implementing new innovations within the NHS, including systemic issues, and behavioural and cultural barriers.	Nuffield Trust (2017). Falling short: Why the NHS is still struggling to make the most of new innovations. Briefing. https://www.nuffieldtrust.org.uk/research/falling-short-why-the-nhs-is-still-struggling-to-make-the-most-of-new-innovations
12	**Artificial intelligence and Robotics.** The report gives an overview of AI technology and how it has been applied in different contexts. It ends by providing a number of recommendations for the use of AI. These include recommendations for the government to support digital skills training (and retraining) for the workforce, which will provide more opportunities. Investment in future generations is also recommended by enabling younger people to develop digital skills.	Perez, J.A., Deligianni, F., Ravi, D. & Yang, G. (2017). Artificial intelligence and Robotics. UK-RAS Network White paper. https://www.ukras.org/publications/white-papers/artificial-intelligence-and-robotics/
13	**What doctor? Why AI and robotics will define New Health** This is a report which summarises a survey done in 2016 by YouGov of several countries worldwide. The training section of the report talks about how training in AI could work. It suggests that training could be iterative and adaptable to meet staff's training needs (which may likely change due to the fast-changing pace of technology).	Price Waterhouse Cooper (2017). What doctor? Why AI and robotics will define New Health. https://www.pwc.com/gx/en/news-room/docs/what-doctor-why-ai-and-robotics-will-define-new-health.pdf
14	**Robotics in social care: a connected care ecosystem for independent living** This report gives an overview of the current crisis in UK social care, highlights the ways in which robotics can be used in social care, gives examples of the ways they are already being used to support specific groups of people, and highlights legal and social issues.	UK-RAS White Paper (2017). Robotics in social care: a connected care ecosystem for independent living. https://www.ukras.org/publications/white-papers/robotics-in-social-care/

	Of key relevance to this project, the report raises the issue that jobs may change, and therefore a reassessment of skills will be needed. It gives a number of recommendations for a strategy as well as a roadmap and timeline for the implementation of these technologies. For these new technologies, a participatory design approach is suggested – this includes involvement with key stakeholders, including carers.	
15	**Scoping study on the emerging use of Artificial intelligence (AI) and robotics in social care** This was a scoping study commissioned by *Skills for Care* on the emerging use of AI and robotics in social care, to review the literature in this area, to explore what is currently being done in health and social care settings, and to highlight workforce issues that might arise with the increasing use of AI in adult social care. The report highlights several workforce implications: it is unlikely that robots will take over healthcare professionals' jobs, but more likely that they can help them to do their jobs better. There is scepticism among the workforce which needs to be addressed. A number of factors were identified for supporting the deployment of AI and robotics, and training and CPD is a key factor. Future training needs – the report gives a number of areas that could be covered in training. For example, 'an introduction to robotics including examples of its application, …work to reduce fears, dispel myths and explore the challenges of integrating AI and robotics into service delivery, …identification of forecast skills needs, guidance on regulation, health and safety' It also gives some suggested recommendations to implement based on the findings of the report. For example: *Skills for Care* working with organisations and academics who are working in AI and robotics research, to make sure that the training and	Consilium Research and Consultancy and Skills for Care (2018). Scoping study on the emerging use of Artificial intelligence (AI) and robotics in social care. https://www.skillsforcare.org.uk/Documents/Topics/Digital-working/Robotics-and-AI-in-social-care-Final-report.pdf

	development needs of the social care workforce are being met at an early stage of the process.	
16	**Government response to House of Lords Artificial Intelligence Select Committee's Report on AI in the UK: Ready, Willing and Able?** In this response, the government has set out its point-by-point response to the House of Lords report. It welcomes many of these changes and detailed how it has already started making changes such as: investing in education (in schools and universities) and developing its national retraining scheme.	Department for Business, Energy and Industrial Strategy (2018). Government response to House of Lords Artificial intelligence select committee's report on AI in the UK: Ready, willing and able? http://dera.ioe.ac.uk/id/eprint/31911
17	**Ethical, social and political challenges of artificial intelligence in health** This report describes a number of use cases and settings and outlines several ethical, social and political challenges associated with the use of AI. Key themes are: Consent, fairness and rights.	Future Advocacy and Welcome Trust (2018). Ethical, social and political challenges of artificial intelligence in health. https://cms.wellcome.org/sites/default/files/ai-in-health-ethical-social-political-challenges.pdf
18	**The NHS at 70: What will new technology mean for the NHS and its patients?** This report describes four main trends that could potentially improve health care (one of them being Artificial intelligence), as well as challenges, potential opportunities, questions to consider, and how the NHS could prepare for these technological advances. Reflections are provided at the end of the report.	The Health Foundation, the Institute for Fiscal Studies, the King's Fund and the Nuffield Trust (2018). The NHS at 70: What will new technology mean for the NHS and its patients? Four big technological trends. https://www.kingsfund.org.uk/publications/nhs-70-what-will-new-technology-mean-nhs-and-its-patients
19	**Artificial intelligence Sector deal** This White Paper describes the Government's AI Sector Deal and the government's strategy for the use of artificial intelligence. It lays out a number of foundations, challenges and principles. Of key relevance to this project, the strategy highlights the importance of investing in people. It is recognized that there is a need to help prepare	HM Government (2018). Industrial strategy: Artificial intelligence Sector deal. White Paper. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/702810/180425_BEIS_

	the workforce for the use of new technology by increasing their digital skills. This necessitates investment in education and skills as well as strengthening links between industry and academia. The government has established some policies to implement this, such as investment in digital skills training and education at the school level and in higher education and postgraduate education (PhD-level), as well as a national retraining scheme. The government has also committed to enabling access to 'global talent' by amending immigration rules to enable highly skilled people to train and work in the UK in this sector.	AI_Sector_Deal__4_.pdf
20	**The forward march of robots halted? Automation, employment and inequality** This blog post talks about technological change and increase in automation- the author puts forward that this will lead to more inequality, as some areas and jobs will be more affected than others. The blog post gives some recommendations of how these potential problems can be anticipated and managed.	Institute for Public Policy Research (2018). The forward march of robots halted? Automation, employment and inequality. Blog by Matthew Lawrence. https://www.ippr.org/blog/the-forward-march-of-robots-halted-automation-employment-and-inequality
21	**Digital change in health and social care** The report is for healthcare organisations wanting to implement digital change. It lays out the main considerations when managing digital change, presents evidence about managing digital change, and uses case studies as illustrations. One key area of the report relates to resourcing and skills, that is in relation to the people working in the organisations and the skills that they might need to successfully deliver change in the organization. Some barriers are outlined, with practical steps to take in order to manage change. One example is to invest in people through skills training. This may help them to feel more engaged in the process. Case studies are given about how barriers relating to resources and skills have been overcome, for example for planning out the deployment of resources, identifying the skills that would be needed from managers of projects, and giving the team	The King's Fund (2018). Digital change in health and social care. https://www.kingsfund.org.uk/publications/digital-change-health-social-care

	incentives to bring about change.	
22	**Robots in workplace 'could create double the jobs they destroy'** This article describes the findings of a report by the World Economic Forum and the impact on jobs and the workforce. It suggests that automation will create more jobs and disrupt current ways of working.	Partington, R. (2018). Robots in workplace 'could create double the jobs they destroy'. The Guardian. https://www.theguardian.com/business/2018/sep/17/robots-in-workplace-could-create-double-the-jobs-they-destroy
23	**More than 6m workers fear being replaced by machines – report** This article describes the concerns of workers about being replaced if their jobs are automated. It refers to the preliminary findings from the commission on workers and technology and reports from other organisations such as the Bank of England and the Centre for Cities.	Partington, R. (2018). More than 6m workers fear being replaced by machines – report. The Guardian. https://www.theguardian.com/business/2018/aug/06/more-than-6m-workers-fear-being-replaced-by-machines-report
24	**Every Nurse an E-nurse. Insights from a consultation on the digital future of nursing** This report outlines the findings of a consultation with nurses about the digital future of nursing. It outlines enablers and barriers in relation to the use of technology and the vision of digitally enabled nursing, as well as examples where implementation has worked well. Some of the barriers were related to training: for example, understaffing which means that nurses have less time for learning new systems, lack of confidence of nurses about their digital competencies, lack of digital skills among nursing and midwifery staff, lack of relevant skills training at undergraduate level/in placements, and problems with IT infrastructure in the NHS.	Royal College of Nursing (2018) Every Nurse an E-nurse. Insights from a consultation on the digital future of nursing. https://www.rcn.org.uk/professional-development/publications/pdf-007013
25	**The rise of technology in care: how will it affect workers?** This article explores how technology in care will affect healthcare workers. Several concerns are highlighted, as well as ethical implications, and implications for people's	Salman, S. (2018). The rise of technology in care: how will it affect workers? The Guardian. https://www.theguardian.com/careers/2018/dec/04/the-rise-

	jobs.	of-technology-in-care-how-will-it-affect-workers
26	**Human Rights, Technology and Social Care** This report summarises the use of technology in social care and describes the challenges and implications with respect to the human rights of users, and other legal and ethical implications. The report relates to social care in Scotland. A number of recommendations are given at the end of the report, one of which is the development of a technology strategy for social care staff so that they can become technologically confident and increase their knowledge and understanding.	Scottish Care (2018) Tech Rights. Human Rights, Technology and Social Care. https://scottishcare.org/wp-content/uploads/2019/11/TechRights-Human-Rights-Technology-and-Social-Care.pdf
27	**Robotics in social care** This note outlines the use of robotics in social care, summarises some of the key issues, and discusses some of the implications and challenges. For example, it is recognised that the use of robotics will increase demand for skills, therefore training will be required for healthcare staff. Other jobs may also be created, and this may have effects on the social care sector. This document contains many citations and links to relevant reports and articles, which can be found in the endnotes.	UK Parliament POSTNOTE (2018). Robotics in social care https://post.parliament.uk/research-briefings/post-pn-0591/
28	**The state of health care and adult social care in England 2018/19** The evidence for this report was taken from the CQC's analysis of its inspection ratings and the data associated with this. This is a large report and there are likely to be different parts of it that are relevant to this project. For example, there are parts which talk about innovation and the use of technology as an enabler of higher quality care. The report also outlines workforce challenges and describes a number of strategies that have been used to address these. The potential benefits of technological innovation are outlined, and then the report describes some barriers that have been highlighted by staff, e.g. attitudes of some	Care Quality Commission (2019). The State of health and social care in England 2018/19 https://www.cqc.org.uk/sites/default/files/20191015b_stateofcare1819_fullreport.pdf

	staff towards technology (e.g. scepticism), perceived complexity of adopting new technologies (including concerns about existing infrastructure), and concerns about ethics and data protection. The report mentions potential inequalities and issues that need to be taken into account – for example language and culture. The report describes several factors in relation to enabling and supporting innovation.	
29	**Commission on Workers and Technology and Fabian society** This report presents some preliminary findings from the Commission on Workers and Technology. (see separate report in 2020 for detailed findings)	Commission on Workers and Technology and Fabian society (2019). Background briefing note. https://fabians.org.uk/publication/commission-on-workers-and-technology/
30	**National strategies on artificial intelligence: A European perspective in 2019.** This report describes the AI sector deal and the main priorities of this strategy. It also lays out different policy areas of interest. Of key relevance to this document are the policies on formal education and training, reskilling and upskilling opportunities, and networking (links between academia, industry and the public sector).	European Commission (2019). National strategies on artificial intelligence: A European perspective in 2019. Country report-United Kingdom. https://knowledge4policy.ec.europa.eu/ai-watch/united-kingdom-ai-strategy-report_en
31	**Automation and the future of work** In this report, the Business, Energy and Industrial Strategy Committee put forward the argument that the UK needs to adopt and start implementing automated technologies as part of the 'fourth industrial revolution'. It describes issues related to the adoption of autonomous technology and gives a number of recommendations. A key part of the report is related to workers, specifically their views about how automation will affect their jobs, and also skills and retraining. Workers should be engaged in the transition process. If workers have to adapt to automation, they may have to either learn or develop skills to work with new technology or retrain for careers that will not be affected to the same extent by automation. It is	House of Commons. Business, Energy and Industrial Strategy Committee. (2019). Automation and the future of work. Twenty-third report of session 2017-2019. https://publications.parliament.uk/pa/cm201719/cmselect/cmbeis/1093/1093.pdf

	recommended that the government provides support to organisations and businesses so that they can transition to increased automation, and that a dedicated strategy is put in place for this so that planning can begin.	
32	**AI in the UK: Ready, willing and able?** The UK is becoming ready to use AI technology, but this brings unique opportunities and challenges. The report explores a number of priorities related to AI and gives some conclusions and recommendations. The report acknowledges the importance of investment in skills training and recommends that this is done in conjunction with industry to prepare the workforce in the use of these skills in their jobs. AI is likely to 'disrupt' a wide range of jobs and many people in the labour market will need to retrain. The national retraining scheme will help the workforce adapt to a changing economy. The education system should also prepare children for the future by helping to improve their digital understanding and digital literacy. The use of AI in healthcare is dependent on the NHS being equipped to use new technology and the staff being trained in how to use it.	House of Lords Select committee on Artificial intelligence. Report of Session 2017-2019. AI in the UK: Ready, willing and able? https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/10002.htm
33	**The NHS Long Term Plan** This report describes the NHS's long-term plan and how it will be implemented. Of relevance to this project are Chapters 4 and 5 which are about the workforce and upgrading technology/implementing digitally enabled care respectively. The NHS recognises the importance of investment in skills in order to be prepared for the future. They have set out a number of plans including: making training more accessible, increasing apprenticeships, increasing investment in CPD for current staff, allowing clinicians to expand their skillset and scope of practice through	NHS (2019). The NHS Long Term Plan. https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/

	credentialling, expanding the NHS Digital Academy programme, and increasing training in digital capabilities. One of their aims is 'creating a secure and capable digitally literate workforce'.	
34	**NHS-X is a joint team which has been set up to help with the digitization of health and care** This report gives an overview of the types of data-driven technologies being used in the NHS and gives information about how they can be used safely and ethically. It also highlights potential barriers and 'pain points' and how these could be addressed, as well as giving a number of case studies as examples. For example, one key factor is upskilling the workforce on a continuous and iterative basis so that they can be prepared for the use of advanced technology in the future. Organisations such as the Alan Turing Institute, Health Data Research UK and the Health Foundation are exploring ways to work together to help with the development of relevant analytical skills and critical thinking expertise.	NHS-X: Artificial intelligence, how to get it right. Putting policy into practice for safe data-driven innovation and health and care. (2019) https://www.nhsx.nhs.uk/ai-lab/explore-all-resources/understand-ai/artificial-intelligence-how-get-it-right/
35	**Imagining Better Care Systems- five ideas for a fairer future** This blog post describes some of the findings from Doteveryone's Better Care Systems workshop, where ideas were generated by stakeholders about how technology could be used to build a better care system. In this post participants highlighted some views and concerns about the implementation of technology.	Nicholas, L. (2019). Imagining Better Care Systems- five ideas for a fairer future. Doteveryone. https://doteveryone.org.uk/2019/02/imagining-better-care-systems%E2%80%8A-%E2%80%8Afive-ideas-for-a-fairer-future/
36	**Better Care in the Age of Automation. Data, skills and culture for a sustainable, effective and fair care system.** This report describes the key foundations needed to support a sustainable, effective	Nicholas, L., Miller, C. (2019). Better Care in the Age of Automation. Data, skills and culture for a sustainable, effective and fair care system. Doteveryone.

	and fair social care system, and gives some recommendations for the government departments in order to deliver better care. The report is based on the Better Care systems project which involved speaking to key stakeholders including service users, their families, carers, and clinicians. A range of experts were also interviewed. One of the main areas of the report relates to skills. Due to technological advancement, carers will need skills. The report also describes the pragmatic and everyday experiences of technology (which they describe using a concept called 'the last ten centimetres) and the authors recognise that technical skills of carers will need to be combined with 'non-automatable' skills such as emotional intelligence. Carers would need to be able to feed back their experiences of using technology that is in development and also seek technical support if they need help. It is recommended that there is investment in skills for care professionals.	https://doteveryone.org.uk/report/bettercare
37	**Achieving a digital NHS: Lessons for national policy from the acute sector** This report is in relation to the digitisation of the NHS and the creation of NHS-X, an organisation that was established to lead national policy for NHS technology, digital and data. The authors of the report examined the policy for digitisation from the perspective of acute trusts, and therefore spoke to senior digital leaders and frontline healthcare professionals. The key findings are reported, and a number of recommendations are given. One of the main parts of the report is titled 'Configuring a digital workforce'. Some challenges include recruiting and retaining the workforce necessary to support digital change. One of the recommendations is the professionalisation of digital health roles.	Nuffield Trust (2019). Achieving a digital NHS. Lessons for national policy from the acute sector. https://www.nuffieldtrust.org.uk/research/achieving-a-digital-nhs-lessons-for-national-policy-from-the-acute-sector
38	**Preparing the healthcare workforce to deliver the digital future** The Topol review suggests that the healthcare landscape is changing, as is the workforce. NHS staff will need to have digital skills and digital literacy in order to deal	Topol review – Health Education England (2019) Preparing the healthcare workforce to deliver the digital future. https://www.hee.nhs.uk/our-work/topol-review

	with new ways of working. Values of patient-centred care will need to be central to these efforts. There will need to be an investment in specialist skills – this will need to be on a flexible and continuous basis. Good leadership and planning will be needed to achieve these outcomes. The report gives a number of recommendations and illustrates these with example use cases and demonstrating technological change over the staff member's career. In the field of AI and robotics, there are recommendations relating to patients, healthcare professionals and the healthcare system. It is recommended that educational resources are developed for healthcare professionals for specialist areas, e.g. health data provenance, ethics of AI, critical appraisal of AI and robotics technologies. Some recommendations are given about the types of skills that education programmes should include (for example, genomics, data analytics and AI, and digital literacy).	
39	**Doctor, who? Shaping a vision for 2040** This report outlines the findings from the Changing Face of Medicine project, which was developed in order to plan for the future of medicine. Of key relevance to this project are the parts about medical education and visionary leadership.	The Changing Face of Medicine Commission under the auspices of The Academy of Medical Royal Colleges (2020). Doctor, who? Shaping a vision for 2040. https://www.aomrc.org.uk/reports-guidance/doctor-who-a-report-by-the-changing-face-of-medicine-commission/
40	**The potential of technology in adult social care. Policy and Practice Brief** This report describes a review of evidence on how technology has been used for the care of older people, and highlights challenges and opportunities. The authors spoke to a number of stakeholders involved in designing and developing technology. A number of key issues are outlined.	Centre for International Research on Care, Labour and Equalities. (2020). The potential of technology in adult social care. Policy and Practice Brief. http://circle.group.shef.ac.uk/wp-content/uploads/2020/10/The-Potential-of-Technology.pdf
41	**The potential of technology in adult social care. Policy and Practice Brief**	The committee on Standards in Public Life (2020). Artificial intelligence and public standards. A review by the Committee

	This report is by the Committee on Standards in Public Life and is addressing artificial intelligence and public standards. They provide a number of recommendations. One of the recommendations is specifically about training and education. They highlight the responsibility of public bodies to ensure that the use of AI complies with regulations, which requires governance frameworks. It is recommended that providers ensure that their employees undertake continuous training and education. This is a key part of risk management when deploying AI. Those who use AI need to be trained in how the AI works and what the risks are. Training should be continuous because technology is continuously updated.	on standards in public life. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/868284/Web_Version_AI_and_Public_Standards.PDF
42	**Sharing the future. Workers and technology in the 2020s** In 2018, a two-year commission was launched by Yvette Cooper MP and the trade union *Community* to investigate the impact of technology on Workers. This was conducted in partnership with the UK's trade unions, and a number of stakeholders from different fields participated. A number of concerns about technological advancement and automation were highlighted. The report highlights the importance of skills, and recommends increase in adult training and education, and support for employers to train their workers. The report also gives a number of suggested solutions to challenges in relation to training and education, for example creating an integrated adult skills system, financial support for workers to undertake training, and supporting retraining via the creation of a national digital service for retraining, and allowing employees to access the union learning fund.	Fabian Society, Community and The Changing work Centre. (2020). Sharing the future. Workers and technology in the 2020s. Summary of the final report of the Commission on Workers and Technology. https://fabians.org.uk/publication/sharing-the-future-full-report/
43	**GMC Response to Committee on Standards in Public life Report** This letter sets out the GMC's response to the report by the Committee on Standards in Public Life. Part of the report acknowledges the skills and training of medical students and qualified doctors and how training programmes and standards will need to adapt to accommodate the use of new technologies and ensure that they are	General Medical Council (2020). GMC Response to Committee on Standards in Public life Report. https://www.gmc-uk.org/-/media/documents/gmc-response-to-committee-on-standards-in-public-life-on-artificial-

	prepared and qualified in their role.	intelligence-and-public-85283035.pdf
44	**AI for Healthcare: Creating an international approach together** This report gives policy guidance and recommendations for organisations considering the use of AI in their healthcare system. The main recommendations are around the four areas summarised below: 1) Leadership – there should be a needs-based approach which enables the best health outcomes, and there should be oversight/leadership at all stages of the AI life cycle (this will include for example, workforce development) 2) Policies should take into account the whole ecosystem/lifecycle (this includes skills gaps) 3) There should be national standards and regulatory processes – this will help to ensure that the AI is used safely. It is important to engage with stakeholders (e.g. patients, healthcare practitioners) for design and implementation as well as building trust. There should be investment in education in public, professional and industry settings. This includes training or retraining of healthcare professionals so that they are equipped to use AI. A number of recommendations were given about what such education should cover (for example, what AI is, how AI can be used and is currently being used in healthcare, and why AI technologies are used and the benefits of using such technologies).	Global Digital Health Partnership. AI for Healthcare: Creating an international approach together. (2020) https://www.nhsx.nhs.uk/ai-lab/explore-all-resources/understand-ai/creating-international-approach-ai-healthcare/
45	**Appendix: Government Response to the BEIS Select Committee's Twenty-third Report** This document details the government's response to the BEIS select committee's report. The government welcomes the recommendations and describes some of their plans and strategies. For example, in relation to reskilling the workforce, the	Appendix: Government Response to the BEIS Select Committee report (2020) https://publications.parliament.uk/pa/cm5801/cmselect/cmbeis/240/24002.htm

	government outlines its plans for a new *Skills and Productivity Board* and a *Get Help to Retrain* service.	
46	**Care System Sustainability: what role for technology? An evidence review** This working paper and evidence review explores the role of technology in social care and also highlights some concerns, such as inequalities in access to technology, described as the 'digital divide'. Skills are also important, and there are inequalities in the digital skills that people have. The infrastructure is also lacking in some areas.	Hamblin (2020). Care System Sustainability: what role for technology? An evidence review. http://circle.group.shef.ac.uk/sustainable-care-publications/
47	**One Year on Progress on the recommendations from the Topol Review** In this report, HEE (Health Education England) outline the steps they are taking to carry out the recommendations from the Topol review. For example, they mention the following: -NHS Digital Academy offering training to help people learn specialist skills and/or become leaders in digital change; formal CPD opportunities and qualifications, MOOCs. -Flexible short courses in subjects such as bioinformatics, clinical and scientific computing, Artificial intelligence, and machine learning. Developed in collaboration with universities (these can be offered as credentialing qualifications to existing NHS staff). -HEE digital readiness programme. -Opportunities for clinicians to specialise and/or have protected and accredited time, e.g. to work with academia.	Health Education England (2020). Topol review one year on. Progress on the recommendations from the Topol Review. https://www.hee.nhs.uk/sites/default/files/Topol%20One%20Year%20On.pdf

	-Senior leaders will identify skills gaps. -Professional bodies have started looking at the types of skills that the workforce might need (this depends on the specific subfield, but one example is Genomics being incorporated into the NMC standards for proficiency). -The NHS clinical entrepreneur programme. -HEE Technology Enhanced learning – a programme developed to help educate the health and care workforce using the most effective evidence informed technology and techniques. It includes digital education (with a new Learning Hub) and simulation and immersive technologies. -HEE is working with universities to ensure genomics and data analytics are included in their undergraduate curricula (for example working with several universities to support and accredit courses in 'Digital Healthcare Science' and is working with several higher education institutions which are delivering Masters programmes in Genomic Medicine.	
48	**People, power and technology: The 2020 Digital Attitudes Report** This report describes the results of a survey and focus groups that Doteveryone conducted to assess the public's appetite, understanding and tolerance towards the impacts of technology on their lives. The findings highlight some key views and attitudes of the public about the use and regulation of technology. A number of recommendations are provided.	Miller et al (2020). People, power and technology: The 2020 Digital Attitudes Report. London: Doteveryone. https://doteveryone.org.uk/report/peoplepowertech2020
49	**Robots are playing many roles in the coronavirus crisis – and offering lessons for future disasters** This article focuses mainly on the coronavirus pandemic and how robots have played	Murphy, R.R. (2020). Robots are playing many roles in the coronavirus crisis – and offering lessons for future disasters. The Conversation.

	a role in assisting humans during this crisis, by helping them to do their jobs. Some implications of technology adoption and implementation are also mentioned.	https://theconversation.com/robots-are-playing-many-roles-in-the-coronavirus-crisis-and-offering-lessons-for-future-disasters-135527
50	**NMC Strategy 2020-2025** This document sets out the NMC's strategy for the years 2020-2025. It summarises evidence collected from April 2019 from key stakeholders, and five draft strategic themes that they will focus on. The NMC have invited feedback in the form of a consultation. Of key relevance to this project, the report acknowledges the advancement of technology and how this will impact upon the skills needed by healthcare professionals.	Nursing & Midwifery Council (2020). NMC Strategy 2020-2025. Consultation on draft strategic themes. https://www.nmc.org.uk/about-us/our-role/our-strategy/
51	**The Grand Challenges** The government's industrial strategy sets out a number of grand challenges, focusing on global trends which will impact on our future. Of relevance to this project, two of the key areas are 'Artificial intelligence and data' and 'ageing society'. The government strives to embed the use of AI and data throughout the UK as it will be useful for creating jobs and this will have positive impacts on the economy. The government also wishes to use innovation to meet the needs of the ageing population, to help people live longer, more independent and healthier lives.	Gov UK – The Grand Challenges (updated 2021) https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges
52	**AI and healthcare** This document is about the use of AI in the healthcare system, including impacts on	Smeaton, J., & Christie, L. (2021). UK Parliament POSTNOTE Research briefing. AI and Healthcare. (2021).

	healthcare and the workforce, as well as potential challenges and areas of concern, and policy changes that may be needed. Main relevant points from this report: there is recognition that AI and automation will have an impact on people's jobs, e.g. they could spend less time on routine work, or they might be able to spend more time with patients. Issues such as ethics and technical issues are recognised as potential barriers to implementation. Stakeholders also acknowledge barriers and previous problems related to implementation of technology in the NHS at the system level– this is usually related to resources and organisation. It is recognised that new skills will be needed, for example technical skills and data skills. New roles may also be created, directly linked to technology. Health Education England has established some education programmes.	https://post.parliament.uk/research-briefings/post-pn-0637/