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Exploring Generational Differences in Physicians' Perspectives on the Proliferation of Technology within the Medical Field: A Narrative Study

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Abstract

Background: The development and advancement of information and communication technologies (ICTs), such as electronic libraries, electronic medical records and computerized physician order entry systems, have made learning and acquiring vast medical knowledge feasible. However, there are limited data pertaining to the navigation of such technologies among physicians of varying generational cohorts.

Objective: The aim of this study was to explore physician experiences and perspectives influencing the adoption of ICTs, with an emphasis on generational differences.

Methods: Semi-structured interviews with focus groups or individual physicians were conducted, recorded and transcribed to elicit key themes.

Results: Across the generations, participants expressed several benefits to ICTs, such as accessibility, efficiency and use of current, evidence-based practice medicine. Common problems encountered included usability issues, downtimes, alarm fatigue, and administrative tasks. There were differences between generations regarding adaptability, perceived benefits and drawbacks and perceptions of other generations' ability to adapt.

Conclusion: Physicians from various generations recognized the overall benefits of implementing ICTs. Although some drawbacks were reported, all participants understood the necessity of ICTs. Furthermore, implementation should be tailored to physician working style and learning needs.

Introduction

As scientific research progresses, more information is acquired. Medical knowledge constantly expands, and there is a plethora of information that physicians must continuously learn (Hardyman et al. 2013). Consequently, physicians must find ways to acquire relevant information in order to provide the most evidence-based and temporally appropriate medical care. Biomedical research data doubles every 20 years; thus, medical professionals must be able to constantly review material and update their knowledge base (Davies 2007). This is most effectively done through the use of electronic libraries and digital information-sharing platforms (Davies 2007). According to Weightman and Williamson (2005), access to library services positively impacts overall patient care, diagnosis, testing, therapy and length of hospital stay.

Electronic medical records and computerized physician order entry (CPOE) systems have been developed to enhance healthcare delivery and reduce medical errors and patient harm (Øvretveit et al. 2007). Prescription medication errors decreased significantly following the implementation of electronic prescribing modalities when compared to manually written prescriptions (Ancker et al. 2012). Furthermore, systematic reviews have concluded that health information technology improved the quality of healthcare by reducing medical errors, improving disease surveillance and enhancing adherence to medical protocols or guidelines (Chaudhry et al. 2006).

Although the benefits of implementing information and communication technologies (ICTs) have been outlined by others, the challenges of implementing these systems and transitioning to their use are ongoing. According to a systematic review conducted by Gagnon and colleagues (2012), there are several factors that have hindered the adoption of ICTs in the clinical setting. Various factors include a lack of perceived benefits, ease of use, familiarity with ICTs, poor support and increased time consumption (Cekada 2012). Moreover, there is a debate over the “digital divide” and generational differences in the adoption of ICTs (Hillman n.d.). Generational cohorts exhibit varying degrees of technological competence. The current workforce is composed of individuals from the Silent Generation (born 1933 to 1945), baby boomers (born 1946 to 1964), Generation X (born 1965 to 1980) and millennials or Generation Y (born 1981 to 2000) (Cekada 2012). Millennials are said to possess expertise regarding technology and generally navigate technology seamlessly (Cekada 2012). Generation X members also use technology and are “more comfortable” with its use in a work environment (Cekada 2012). The Silent Generation and baby boomers did not grow up with pervasive use of technology in everyday life and as a result tend to be more reluctant to adopt its use (Cekada 2012). The aim of this study was to explore various physicians' experiences with



HUMBER RIVER HOSPITAL is one of Canada's largest community acute care hospitals, serving a population of more than 850,000 people in the north-west Greater Toronto Area. The multi-site hospital currently operates out of its Wilson Avenue acute care site and Finch and Church Street reactivation care centres with a total of 722 beds, just over 3,800 employees, approximately 700 physicians and over 1,000 volunteers.

Affiliated with the University of Toronto and Queen's University, Humber River Hospital is North America's first fully digital hospital. Part of Humber River Hospital's digital infrastructure includes completely automated laboratory services, robots sorting and mixing medications, electronic health records, tracking systems, for patients undergoing surgery, that update families through their cellphones and patient bedside computer terminals – all varieties of technologies that automate information, eliminate paper and provide a connected experience for patients, staff and families.

Humber River Hospital was awarded Accreditation with Exemplary Standing in 2018 and, since its opening in 2015, has received numerous awards and accolades for technological advancements and innovation (www.hrh.ca).

using and navigating ICTs, with a unique emphasis on the generational differences.

Methods

Study design and participants

Humans frequently use stories as a tool to transfer knowledge (Riessman 1993). A narrative inquiry approach was used to generate in-depth understanding of physician experiences in a technology-driven healthcare environment, with a special emphasis on generational differences or similarities. Detailed descriptions were elicited from physicians and subsequently interpreted to extract key themes. Eligible physician participants included physicians employed at Humber River Hospital (HRH) for a minimum of 1 year, legal adults and those who are able to converse fluently in the English language. In addition,

participants possessed the capacity to consent. Veritas IRB, an independent Research Ethics Board, approved the study.

Data collection

Data were gathered through semi-structured, in-depth interviews with eligible physician participants at HRH in November and December 2019. Participants were interviewed in a one-on-one session or focus group setting. Interview setting was based on participant preference and availability. Focus group settings lasted approximately 45 minutes, and one-on-one sessions ranged from 15 to 20 minutes in duration. Informed consent and demographic information were obtained at the time of the interview. Trained research team members conducted the interviews until sufficient data were obtained.

Data analysis

The interview text was coded and analyzed by using a categorical-content approach (Lieblich et al. 1998). This approach allowed the researchers to focus on the content of participants’ stories and highlight key themes in the interview. The process involved an ongoing analysis to refine each theme and selection of compelling text to highlight them. Descriptive statistics were generated for the demographic survey data.

Results

Four themes emerged from the analysis of the narrative accounts: adaptability, benefits and drawbacks, responses to technological change and perceptions of other generations. The demographic characteristics of participants are presented in Table 1.

Adaptability

Participants spoke about their ability to learn and adapt to information systems and the technological environment. Participants of all generations acknowledged that there was some adjustment period, but, ultimately, they did not have major difficulties navigating technologies within the medical field:

[I adapted] very quickly, just because I was so receptive. If I was not receptive, I wouldn’t have done it. I’m actually computer illiterate. But once I know which buttons to type, I’m okay. (Silent Generation participant)

So order entries, online ordering, electronic charts – that was a bit of adaptation. It wasn’t horrible, but in the past, we had paper charts on the floor. [With the] paper chart, you physically write your note in the chart, and when you make rounds, you carry around ... 15 charts and you have to go and sit down and do all these notes. And when they introduced paperless charts,

TABLE 1.
Demographic characteristics of physician study participants, n = 11

Generation	n	%
Millennial	3	27.3%
Generation X	2	18.2%
Baby boomer	5	45.5%
Silent Generation	1	9.1%
Gender		
Male	9	81.8%
Female	2	18.2%
Gender diverse	0	0.0%
Years of experience as a physician		
3 to < 5 years	2	18.2%
5 to < 10 years	1	9.1%
10+ years	8	72.7%
Length of time at Humber River Hospital		
1 to < 3 years	1	9.1%
3 to < 5 years	2	18.2%
5 to < 10 years	4	36.4%
10+ years	4	36.4%

there was a huge pushback, as if that was such a great system that we were leaving behind! [Laughs] It was a horrible system. And it just took a little while to realize, to get comfortable, and then it was so much better. (baby boomer participant)

... I’m independent enough that I could figure everything out for myself; it’s not hard. But you do have to sort of sit down and play with it sometimes to figure out what the constraints of the system are and how to get it done. (Generation X participant)

[Adapting to new technology] was okay – probably better than [for] some of the colleagues that are not as used to computers, but not as well as I thought I

would, given that I was a proponent of digital charting before I became staff. (millennial participant)

Benefits and drawbacks

Participants generally embraced ICTs, citing access to real-time, evidence-based clinical information as a key benefit. Significant time savings, better patient health outcomes, faster workflows and accessible and easily retrievable data were also perceived as benefits of technology:

Everything is sort of easy to access, whereas before we had to take our own X-rays and slap them on the screen, and by the time they came from Radiology, it was very slow. Now, as soon as they take an X-ray, it's there. (Silent Generation participant)

Technology is reaching ... the point, getting to the point, where you can use your phone as a screen and do an ultrasound at the bedside that way. So that's what I'm ... waiting for. Just walk around with a transducer; it's going to replace the stethoscope. So the drain on resources will be much ... less of a drain, and [there will be] more timely diagnosis. (baby boomer participant)

Electronic medical records make things a lot easier. [An] easy example would be [that] before, if you wanted to check an old X-ray, you had to go downstairs to the radiology lab, ... you would have had to go downstairs to a place, request records, wait maybe a day before you could get them and then ... find another place where you could actually flip through these pages and pages of papers and look. And right now, all of that is done in a matter of seconds on the computer. Huge difference. (Generation X participant)

It really has changed my workflow significantly. It's nice to have all the information ... in one place; it's nice to have something that's legible. And I don't need to worry about who has the chart when I need the patient's chart to access something. That has made it easier for sure. (millennial participant)

However, participants also described experiencing less positive encounters with technology. For example, many encountered usability issues, system downtime, alarm fatigue, heavy administrative workloads and having to invest additional time in online documentation:

It gets really bad when the system is down [because] you've become 100% dependent on [technology]. (baby boomer participant)

Now we have a lot more alerts than we used to have that are invalid – that we just ignore. With the CPOE, when there's something that's ordered that should not have been ordered, ... that should be prompted. But because we prompt everything else, we just ignore it. I think that makes it a bit worse. (millennial participant)

Responses to technological change

The response to technological change was a theme that continuously emerged throughout the interviews. Participants described both excitement and thresholds for adopting technology. For example, one participant from the baby boomer generation noted that they valued and were open to change but found that not all technological changes were suitable later in their career:

When you get older, adapting [to] a new technology is probably not beneficial in the long run. Because I'm maybe going to work another 4, 5 years. Who knows? I don't know. But if I was starting, I'd be very interested in [learning a new technique]. When I started my career, I wasn't doing half the stuff I'm doing [a surgical technique], and I just learned it as I was going. So you need to be open to that. But when you get older, if you're not going to be using it for 20 years, then ... why bother going through the whole hassle? ... But if somebody comes up to me asking, "Do you do the [new technique]", I [say] "No, but I have a guy I can send you to." You have to be ready to let go.

The following participant from the Silent Generation expressed optimism about continuing to learn new technology but also indicated that they would continue to use paper documentation in addition to electronic documentation as they found it to still be valuable to their practice:

The way the computerization is working in the hospital – I'm very optimistic. It's only going to get better. Even I'm learning how to do it quicker. Organize my material. But I think I'm still going to walk around with a clipboard in my hand.

One participant from Generation X recounted feeling excitement during the dot-com bubble, a period of massive growth in the use of the Internet:

... [T]his is what I grew up with: the invention of the Internet. I remember when I was in high school, the Internet, email, was amazing. My first year of university, there was a great thing called email. Oh, my god, I'm talking to people for free. It was crazy. But those were the formative years, where you become more functional

as a student, transitioning into a career, and then all this technology is coming in and you're just soaking it all in. So it's all second nature to my generation.

Lastly, one millennial participant illustrated what is known as the digital divide, an uneven distribution in the access or use of modern technology between demographics and geographical regions, through the following narrative:

I'm from a small town, so everything came later to us. We were the last one to get computers, so I lived through that transition. I had to go up on the roof to change the antenna to listen to a different channel. And now I live in a world where I drive an electric car and my phone controls my whole house. I've transitioned. [Laughs]

Perceptions of other generations

An additional recurrent theme was participants' perception of how other generations of physicians were adapting to learning new technology. Only some participants noted that they perceived there was a gap in adopting technology between older and younger physicians, whereas others felt that there were no drastic differences in attitudes and adoption of technology between the generations of physicians in the hospital:

I found that some of the older folks – not that I'm a screaming youngster – but I found that ... for those that were complacent – “Well, in my day, [it] used to be like this” – they didn't really want to have any part of it, and then they wouldn't order things properly, and then it caused it all kinds of different problems. The drawback to technology is that there has to be buy-in by all of the end-users. ... [B]ut to be fair, I could just think of one or two examples of that. It certainly wasn't widespread in my opinion. (baby boomer participant)

The generation before me probably has a lot more [difficulty] picking up some of the technology aspects. [One physician I know] actually ... bought typing programs because he didn't know how to type. So he had to learn how to type on a computer. ... [P]retty much at my generation and afterwards, there's nobody who doesn't know how to type. Older generations definitely have a more difficult time. (Generation X participant)

There's a certain number of them who are going to be negative about it. You're not going to get 100% of them agreeing on anything. So some of the doctors are very “anti” – ... they say it takes too much time. So there's

always somebody complaining about something or other. (Silent Generation participant)

I find the younger generations are asking, “Well, why isn't this working this way? This doesn't make any sense.” Meanwhile, some of my colleagues who can't even get their phones to do group texting are adapting quite quickly. So I was actually surprised by how some of my younger colleagues struggled way more than I would have expected them to, and vice versa. I thought that a lot of my colleagues from older generations would struggle far more than they actually do. (millennial participant)

Discussion

In this study, we explored physicians' experiences with using and navigating ICTs and focused our exploration on the generational differences in their experiences. The findings from this study revealed that in terms of adapting to ICTs, all generational cohorts of physicians experienced adjustments. For the Silent Generation physicians who participated in our study, “which buttons to type” was the prevailing sentiment, highlighting the key working-style attribute of the Silent Generation to adapt to versus rebel against changes in the workplace (Evans et al. 2016). The baby boomer participants in this study were confronted with the new norm of paperless practice. In keeping with the notion of the “digital immigrant,” whereby the baby boomer generation had limited technology exposure, participants in this study suggested that once they realized the potential benefits of ICTs and became comfortable with it, then technology adaptation was much better (Autry and Berge 2011). In the Generation X participants, the findings from this study suggested that adaptation was experienced as unperturbed. This aligns with the top most self-reported generational distinction of Generation X as technology users (Stewart et al. 2017). Millennials in our study suggested that they experienced a smoother adaptation to ICTs than their colleagues did. However, the experience of millennial adaptation to ICTs was surprisingly not as easy as they had anticipated given their “digital native” status as being “hardwired to think from a technology perspective” (Autry and Berge 2011: 464).

Relatively few studies have examined how different generations accept and embrace change, yet acceptance of change is fundamentally dependent on the support and enthusiasm of people (Ludviga and Sennikova 2016). Ludviga and Sennikova (2016) suggested that the response to change is different depending on the generation and, in particular, when it involves ICTs. Engagement, one of the key factors in successful change management, is critical in the introduction of healthcare ICTs (Ludviga and Sennikova 2016). The findings from this study suggested that the variation in adaptation to ICTs across

generational cohorts requires thoughtful change management planning and execution.

Physicians who participated in this study experienced several benefits and drawbacks of healthcare ICTs. All generations expressed the benefits of ICTs in terms of time savings, faster workflows, accessibility and ease of information retrieval and availability of real-time, evidence-based practice information. Participants from the Silent Generation and Generation X viewed time saving as a main benefit of healthcare ICTs. For the baby boomer participants in this study, the benefits of healthcare ICTs were expressed as the optimistic anticipation of further advancements in ICTs that would support physician practice. Millennials valued most the benefit of ICTs as improving workflow and enabling information that is legible and easily accessible as it is all in one place.

Given the variation in benefits of ICTs experienced across the generational cohorts of study participants, the planning and implementation of ICTs could be strengthened by a value proposition that incorporates the primary benefits of ICTs as conveyed by the predominant users of the system. According to Tantalo and Priem (2016), "[V]alue creation is essential for strategic success" (p. 314). In our hospital, physicians across the generational groups experienced time saving, continuous advancement of ICTs and improved workflow as key benefits. Although much of the foundational ICTs have already been implemented at HRH, future ICTs planning and implementation should consider the alignment of these core benefits with the decisions made regarding the type of ICTs selected for implementation and approach by which it would be implemented. In the case of hospitals that are at the beginning of ICTs planning and implementation, an understanding of physician end-users' expected benefits of ICTs may support enhanced acceptance and adaptation.

In general, physician participants across all generations experienced drawbacks of ICTs in the form of usability issues, downtimes, alarm fatigue and heavy administrative burden. Interestingly, baby boomer participants experienced the most discomfort with downtimes, expressing a clear dependency on the technology and a heavy reliance on ICTs in their practice. This suggests to us that once baby boomers buy into ICTs, they are all in. As previously mentioned, baby boomer participants in this study viewed the continuous advancement of ICTs with optimistic anticipation. Both experiences conveyed by baby boomer participants suggest that this generational cohort may be a key influencer in the process of managing and steering change because of their potential to shepherd those in other cohorts through the period of resistance that they themselves overcame to achieve ICTs acceptance. Potentially, resistance can play an important role in organizational change when leveraged as an opportunity to gain a better understanding of

the issues inhibiting a successful change process (Downs 2012; Gonçalves and da Silva Gonçalves 2012).

In this study, the perceptions of physician participants across generational groups were sought regarding how they viewed other generations' adaptation to ICTs. Those from the Silent Generation held the view that essentially all other generations needed to get on with it and stop complaining. In contrast, the baby boomer generation suggested that buy-in was essential across all generational groups to achieve acceptance and foster ICTs adaptation. Generation X participants perceived that empathetic understanding was necessary for all other generational groups if ICTs adaptation was to be successful. Finally, the millennial generation participants suggested that ICTs should be configured to fit with their unique workflow and informational needs. Similar to previous studies, our findings align with the working-style attributes of each of the different generational groups (Blevins 2014; Evans et al. 2016; Ludviga and Sennikova 2016; Stewart et al. 2017). Our findings suggest that there is a need to reduce the disconnection between ICTs education and generational requirements based on working-style attributes and learning needs.

Limitations

This study has some limitations that must be addressed. Social desirability bias and selective memory may have influenced the participants' narratives. As well, the narratives elicited in this study may not cover the whole range of experiences of physicians from all generations. Furthermore, recruitment included a small sample of interviews from a single hospital site, which limits the generalizability of the findings. These findings are considered to be hypothesis-generating observations.

Conclusions

The implementation of ICTs in healthcare delivers both benefits and challenges for hospitals and clinicians (Cekada 2012). The digital divide and generational differences in physician adoption of ICTs (Hillman n.d.) have not been broadly studied. The aim of this study was to explore various physicians' experiences at HRH with using and navigating ICTs, accentuating the generational differences. Similar to previous studies, physicians who participated in this study experienced several benefits and drawbacks of healthcare ICTs (Cekada 2012; Gagnon et al. 2012). All generations of physicians who participated in this study expressed the benefits of ICTs in terms of time savings, faster workflows, accessibility and ease of information retrieval and availability of real-time, evidence-based practice information. Respondents across all generational cohorts reported drawbacks such as usability issues, downtimes, alarm fatigue and heavy administrative burden. Generational differences were found in the adaptation to ICTs, perceived benefits and drawbacks of ICTs and views about how other

generations adapt to ICTs. Our findings suggest that there is a need to reduce the disconnection between ICTs education and generational requirements based on working-style attributes and learning needs. Since baby boomer participants in this study viewed the continuous advancement of ICTs with optimistic anticipation, there is the potential for this generational cohort to be a key influencer in the process of managing and steering change.

What We Learned:

1. The variation in adaptation to ICTs across the generational cohorts requires thoughtful change management planning and execution. For hospitals at the beginning of ICTs planning and implementation, an understanding of physician end-users' expected benefits of ICTs may support enhanced acceptance and adaptation.

2. The variation in the benefits of ICTs experienced by different generational cohorts suggests that planning and implementation of ICTs could be strengthened by a value proposition that incorporates the primary benefits of ICTs as conveyed by the predominant users of the system.

3. The baby boomer generational cohort may be a key influencer in the process of managing and steering change because of their potential to shepherd those in other cohorts through the period of resistance that they themselves overcame to achieve ICTs acceptance.

References

Ancker, J.S., L.M. Kern, E. Abramson and R. Kaushal. 2012. The Triangle Model for Evaluating the Effect of Health Information Technology on Healthcare Quality and Safety. *Journal of the American Medical Informatics Association* 19(1): 61–65. doi:10.1136/amiajnl-2011-000385.

Autry, A.J. Jr and Z.L. Berge. 2011. Digital Natives and Digital Immigrants: Getting to Know Each Other. *Industrial and Commercial Training* 43(7):460–66. doi:10.1108/00197851111171890.

Blevins, S. 2014. Understanding Learning Styles. *Medsurg Nursing* 23(1): 59–60.

Cekada, T.L. 2012. Training a Multigenerational Workforce: Understanding Key Needs & Learning Styles. *Professional Safety* 57(3): 40–44.

Chaudhry, B., J. Wang, S. Wu, M. Maglione, W. Mojica, E. Roth et al. 2006. Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care. *Annals of Internal Medicine* 144(10): 742–52.

Davies, K. 2007. The Information-Seeking Behaviour of Doctors: A Review of the Evidence. *Health Information and Libraries Journal* 24(2): 78–94. doi:10.1111/j.1471-1842.2007.00713.x.

Downs, A. 2012. Resistance to Change as a Positive Influencer: An Introduction. *Journal of Organizational Change Management* 25(6): 780–83.

Evans, K.H., E. Ozdalga and N. Ahuja. 2016. The Medical Education of Generation Y. *Academic Psychiatry* 40(2): 382–85.

Gagnon, M.P., M. Desmartis, M. Labrecque, J. Car, C. Pagliari, P. Pluye et al. 2012. Systematic Review of Factors Influencing the Adoption of Information and Communication Technologies by Healthcare Professionals. *Journal of Medical Systems* 36(1): 241–77. doi:10.1007/s10916-010-9473-4.

Gonçalves, J.M. and R.P. da Silva Gonçalves. 2012. Overcoming Resistance to Changes in Information Technology Organizations. *Procedia Technology* 5: 293–301. doi:1016/j.protcy.2012.09.032.

Hardyman, W., A. Bullock, A. Brown, S. Carter-Ingram and M. Stacey. 2013. Mobile Technology Supporting Trainee Doctors' Workplace Learning and Patient Care: An Evaluation. *BMC Medical Education* 13(1): 6. doi:10.1186/1472-6920-13-6.

Hillman, S. n.d. *Online Usability Testing with Different Generations: Digital Natives and Digital Immigrants in the Online Usability Space*. Retrieved March 18 2020. <<http://clab.iat.sfu.ca/pubs/DigitalNativesTechReport.pdf>>.

Lieblich, A., R. Tuval-Mashiach and T. Zilber. 1998. *Applied Social Research Methods, Vol. 47. Narrative Research: Reading, Analysis, and Interpretation*. SAGE Publishing, Inc.

Ludviga, I. and I. Senikova. 2016. Organisational Change: Generational Differences in Reaction and Commitment. Presented at the 9th International Scientific Conference Business and Management, May 12–13, 2016, Vilnius, Lithuania. Retrieved March 18, 2020. <<http://bm.vgtu.lt/index.php/verslas/2016/paper/viewFile/11/11>>.

Øvretveit, J., T. Scott, T.G. Rundall, S.M. Shortell and M. Brommels. 2007. Improving Quality through Effective Implementation of Information Technology in Healthcare. *International Journal for Quality in Health Care* 19(5): 259–66. doi:10.1093/intqhc/mzm031.

Riessman, C.K. 1993. *Narrative Analysis* (Vol. 30). Newbury Park, CA: SAGE Publishing, Inc.

Stewart, J.S., E.G. Oliver, K.S. Cravens and S. Oishi. 2017. Managing Millennials: Embracing Generational Differences. *Business Horizons* 60(1): 45–54.

Tantalo, C. and R.L. Priem. 2016. Value Creation through Stakeholder Synergy. *Strategic Management Journal* 37(2): 314–29.

Weightman, A.L. and J. Williamson. 2005. The Value and Impact of Information Provided through Library Services for Patient Care: A Systematic Review. *Health Information & Libraries Journal* 22(1): 4–25. doi:10.1111/j.1471-1842.2005.00549.x.

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