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## Commentary

### Disruptive innovation in community pharmacy – Impact of automation on the pharmacist workforce



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## S U M M A R Y

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Pharmacy workforce planning has been relatively static for many decades. However, like all industries, health care is exposed to potentially disruptive technological changes. Automated dispensing systems have been available to pharmacy for over a decade and have been applied to a range of repetitive technical processes which are at risk of error, including record keeping, item selection, labeling and dose packing. To date, most applications of this technology have been at the local level, such as hospital pharmacies or single-site community pharmacies. However, widespread implementation of a more centralized automated dispensing model, such as the 'hub and spoke' model currently being debated in the United Kingdom, could cause a 'technology shock,' delivering industry-wide efficiencies, improving medication accessibility and lowering costs to consumers and funding agencies. Some of pharmacists' historical roles may be made redundant, and new roles may be created, decoupling pharmacists to a certain extent from the dispensing and supply process. It may also create an additional opportunity for pharmacists to be acknowledged and remunerated for professional services that extend beyond the dispensary. Such a change would have significant implications for the organization and funding of community pharmacy services as well as pharmacy workforce planning. This paper discusses the prospect of centralized automated dispensing systems and how this may impact on the pharmacy workforce. It concludes that more work needs to be done in the realm of pharmacy workforce planning to ensure that the introduction of any new technology delivers optimal outcomes to consumers, insurers and the pharmacy workforce.

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## Background

'Access to medicines' is a key component of primary health care. According to the World Health Organization it is underpinned by four factors: (i) rational selection and use of medicines; (ii) affordable prices; (iii) sustainable financing; and (iv) reliable health and supply systems.<sup>1</sup> Pharmacists are integral to all of these factors, particularly as part of a reliable supply system. In most countries the majority of the pharmacist workforce is employed in community pharmacies where they are remunerated to dispense or supply medicines under either private or public financing arrangements.

This often forms a key component of the pharmacy's income and consumes much of the pharmacist's productive time. Whilst it is suggested that the current system of dispensing through community pharmacy is inefficient and outdated there has been little incentive for widespread change.<sup>2</sup>

Like all industries, health care is exposed to potentially disruptive technological changes. Automated dispensing systems have been available to pharmacy for over a decade<sup>3–5</sup> and have been applied to a range of repetitive technical processes which are at risk of error including record keeping, item selection, labeling and dose packing. Theoretical benefits include efficiencies in pharmacy workflow,<sup>6</sup> improved stock control<sup>7</sup> and enhanced safety through the reduction of dispensing errors.<sup>8,9</sup> The most common applications to date have been within localized systems such as hospital pharmacies or single-site community pharmacies.<sup>3</sup> However, if

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more widespread adoption of automation was to take place, this may have significant implications for the organisation and funding of community pharmacy services as well as pharmacy workforce planning. In turn, the requirement for modified workforce capabilities would need to coincide with changes in university curricula and graduate training programs to support these opportunities. When viewed through this prism of potential automation-driven upheaval, pharmacy workforce planning requires a much greater sense of urgency than in recent decades.

Currently the application of automated dispensing technology is still evolving, and it is unclear how technology will ultimately impact pharmacy services and be integrated into different health systems. The scenario where an automated dispensing machine is installed in an existing community pharmacy dispensary, replicating existing work practices in a more efficient manner might be thought of as a fully decentralized automation model. At the other end of the scale is a fully centralized model. This involves a 'wide area network' of multiple pharmacies with dispensing computers connected over a large geographical area with a single large-scale automated dispensing facility. Prescriptions presented at the pharmacies could be dispensed at the central facility and dispatched back to the original pharmacy, directly to the consumer or to another designated pick-up location. While less common than the decentralized model, examples include centralized automated multi-dose drug dispensing for elderly consumers as found in Australia, Scandinavia and the Netherlands,<sup>10–12</sup> selective centralized dispensing for consumers with chronic (stable) conditions in South Africa<sup>13</sup> and the 'hub and spoke' model currently being debated in the United Kingdom (UK).<sup>14,15</sup>

In the decentralized automation model, gains in efficiency are realized within the individual pharmacies. This provides little impetus to change other aspects of the health system, including the funding of dispensing. Efficiency benefits are generally not passed to consumers or funding agencies. However, widespread implementation of a centralized model could cause a 'technology shock,' delivering industry-wide efficiencies, improving medication accessibility and lowering costs to consumers and funding agencies. Furthermore, some of pharmacists' historical roles may be made redundant and new roles may need to be created, decoupling pharmacists to a certain extent from the dispensing and supply process. It also creates an additional opportunity for pharmacists to be acknowledged and remunerated for professional services that extend beyond the dispensary, which already occurs in some countries.<sup>16</sup>

The impact of the above scenarios highlights the need for a far greater understanding of our workforce. As such, supply and demand side factors related to the pharmacy workforce need to be reconsidered to enable a platform where robust simulations of the potential impact of new technologies, practice models or automation models can be evaluated in an objective manner.

### Current pharmacy workforce literature

A systematic review of 69 papers on the pharmacy workforce was undertaken in 2009.<sup>17</sup> The key trends identified included the feminization of the pharmacy profession (more female pharmacy graduates than males); more males in the over 50 year age bracket; mal-distribution across urban and rural areas; and a planned expansion of university places in a number of countries in response to a perceived under-supply. Many of these trends are common across a range of health professions and are not specific to the pharmacy workforce.

The 'stock and flow' forecasting approach used to estimate the required pharmacist workforce in many of these studies has been criticized. Scott et al.<sup>18</sup> noted that health workforce planning has

historically focused on analyzing workforce issues in 'silos,' that is, in isolation from population health outcomes, consumer demand and the activities of other health professionals. These estimates provide relative numbers of professionals available but mask the more important question of whether they are being used in the most efficient way.

Further, when estimates of consumer demand are considered, the current level of services (for example, the number of prescriptions dispensed) has often erroneously been accepted as a predictor of current and future workload and workforce demand. On one hand, this fails to recognize the efficiencies created by changes, such as automation, and so overestimates workforce demand. On the other, it may underestimate demand by not recognizing types of professional practice that may be offered in the future by pharmacists, or including an estimate of unmet demand (including consumers who cannot afford or cannot access a service).

A more meaningful approach to workforce analysis requires more comprehensive estimates of consumer demand alongside better estimates of supply. Given that the proposed benefits of centralized automated dispensing systems are likely to hold appeal with funding agencies and insurers, it seems prudent that pharmacists consider how their professional roles might change under such a system. It is likely that the requirement for pharmacist labor, their roles and consumer demand for their professional services will change to varying extents under different models and in different countries. This paper details three models of centralized automated dispensing that have been selected for the purpose of illustration. Two are already operating and the third is currently being debated.

### Existing and proposed centralized automated dispensing models

Of the three examples of centralized automated dispensing systems, the first two models are limited to particular consumer groups – the elderly and those with stable chronic conditions, whereas the third has general application. The first is a centralized automated multi-dose drug dispensing service, predominantly for elderly consumers.<sup>10–12</sup> Consumers can be residents of nursing homes or community-dwelling consumers who take multiple medicines and have difficulty with keeping track of and taking their medicines. Repackaging of medicines into dose administration aids can assist safe administration however manual repackaging can be tedious and carries risk of error<sup>19,20</sup> whereas automated repackaging into single dose disposable sachets, labeled with the contents provides enhanced accuracy and safety. Due to the capital costs, repackaging is increasingly being consolidated at central locations and distributed to the consumer or to the local pharmacy for collection.

The second is a 'chronic dispensing unit' provided through the public health sector in South Africa.<sup>13</sup> This unit was established due to the growing pressure of maintaining medicine supply to those with stable chronic conditions, including HIV/AIDS. In this model, once patients are stable their health facility pharmacy sends their checked prescriptions to the central dispensing unit which utilizes a semi-automated dispensing process for on-going supply.<sup>21</sup> Dispensed medication(s) are sent directly from the centralized unit to the health facility for collection by the consumer.

The third model has been dubbed the 'hub and spoke' model and is currently being debated in the UK.<sup>14,15</sup> This model is similar to the South African model, except it is provided through the private sector and could potentially account for two thirds of England's prescriptions.<sup>22</sup> Here, a central 'hub' dispenses medication from an electronic prescription which is then delivered to the pharmacy

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