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Perspectives of primary care nurses on the organization of the COVID-19 vaccine rollout: a qualitative study

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Abstract

Background Primary care nurses, including nurse practitioners (NPs), registered nurses (RNs), and licensed practical nurses/registered practical nurses (LPNs/RPNs), play a pivotal role in pandemic management and outbreak planning. There is extensive literature surrounding COVID-19 vaccination efforts in Canada; however, limited research addresses the involvement of primary care nurses, as well as the organization and integration of these efforts into primary care settings. This study aimed to describe the organizational challenges, barriers, and facilitators to primary care nurses' roles in COVID-19 vaccination.

Methods As part of a mixed methods case study, we conducted semi-structured qualitative interviews with primary care nurses employed in regions across four Canadian provinces: British Columbia, Ontario, Nova Scotia, and Newfoundland and Labrador. During the interviews, nurses described their activities throughout different phases of the COVID-19 pandemic, factors that facilitated or impeded their efforts, and potential contributions nurses could have made. We applied a thematic analysis approach and analyzed codes related to the organization of the COVID-19 vaccination rollout.

Results We interviewed 76 nurses (24 NPs, 37 RNs, and 15 LPNs/RPNs) between May 2022 and January 2023. We identified five overarching components of the COVID-19 vaccination rollout that influenced primary care nurses' perceptions and experiences: (1) information, (2) training, (3) coordination, (4) integration, and (5) compensation. Participants reported both positive and negative experiences with the vaccine rollout. Rapidly evolving information made it difficult for nurses to stay informed and training for vaccine delivery posed barriers due to time requirements and redundancy. Support was often lacking for new electronic systems, and regional coordination varied, sometimes resulting in miscommunication. Delays in integrating vaccination into primary care, logistical challenges, and disparities in compensation between nurses and physicians also presented challenges.

Conclusions Findings highlight the critical roles of primary care nurses in mass vaccination campaigns, underscoring the need for targeted information, effective training, streamlined coordination, better integration into primary care,

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and more equitable compensation. Integrating these services into primary care can enhance future vaccination efforts by leveraging nurses' expertise to improve vaccine access and delivery.

Keywords Primary care, Nursing, COVID-19, Vaccination, Pandemic preparedness, Qualitative research

Background

The COVID-19 pandemic prompted an unprecedented global effort to quickly develop and distribute vaccines. In Canada, COVID-19 vaccines became available by late 2020 [1] and were distributed in a phased approach [2, 3]. The phased approach prioritized the elderly, those with pre-existing conditions, and essential healthcare workers for vaccination, following framework recommendations of the National Advisory Committee on Immunization (NACI) [2, 4]. This approach to the COVID-19 vaccine rollout was in-line with those used in many other high-income countries [5, 6]. Notably, the NACI framework also included the prioritization of individuals living or working in higher-risk environments (e.g., Indigenous communities, carceral facilities, migrant workers, and agricultural facilities) [2, 4, 5]. As of June 30, 2024, just over 107 million COVID-19 vaccine doses had been administered in Canada [7]. In Canada, the provinces and territories are generally responsible for the organization and delivery of health services including the COVID-19 vaccination. Although specific approaches varied during the pandemic, provinces operated mass vaccination centres and mobile clinics. By March 2021, community pharmacies and primary care clinics also provided initial and booster doses [8].

Despite Canada's success in distributing vaccinations to a large proportion of its population, the vaccine rollout was not without its challenges. Delays in vaccine deliveries led to adjustments in distribution schedules, causing frustration among the public and healthcare providers [9, 10]. Communication gaps between different levels of government and the public hindered the dissemination of clear vaccine information [11, 12]. Vaccine hesitancy also emerged as a hurdle, requiring tailored public health campaigns to address concerns and vaccine mandates to increase vaccine uptake [12–15]. Vaccine accessibility also posed technological, geographical, language, and human resource challenges [2, 14, 16]. As the COVID-19 pandemic developed, Canada, like many other countries such as Australia, United States, United Kingdom, Singapore, and Hong Kong, shifted their vaccine strategy from hospital settings and mass vaccination sites to focus on broad distribution through primary care clinics and pharmacies [5, 17] with the intention of increasing vaccine uptake and furthering vaccine accessibility among the general public. Targeted outreach plans were developed simultaneously in attempts to reach equity-deserving individuals not able to access these sites.

Previous research has demonstrated the importance of nurses in pandemic vaccine campaigns and the benefits that the nursing workforce can provide when it comes to pandemic management and outbreak planning [18–20]. Previously, we described four key functions carried out by primary care nurses: educating patients and the public about vaccines, administering vaccines, performing outreach to vulnerable and underserved populations, and advocating for access to vaccines for high-risk patients [21]. This study aimed to describe the challenges, barriers, and facilitators to primary care nurses' roles in COVID-19 vaccination to provide evidence for future pandemic and public health emergency planning.

Methods

This study was part of a broader cross-provincial mixed-methods case study examining regions in British Columbia (BC), Ontario (ON), Nova Scotia (NS), and Newfoundland and Labrador (NL). We chose these regions because they align with the workplaces of the four lead investigators and allowed us to replicate methods previously used in a project that examined family physicians [22], enabling us to have complimentary data from different primary care providers. These regions also provide variability in their pandemic timelines and responses, and the degree of and approaches to integration of family practices into primary care teams. For the purposes of the study, we categorized the duties of nurses throughout different phases of the pandemic as roles [21, 23]. Our primary focus was to evaluate the organization of the COVID-19 vaccine rollout from the perspective of primary care nurses, which include Nurse Practitioners (NPs), Registered Nurses (RNs), and Licensed Practical Nurses (known as Registered Practical Nurses in Ontario) (LPNs/RPNs). Each primary care nurse provider has a unique legislated scope of practice, education/training requirements, and are provincially regulated. NPs are master's degree-trained and have the broadest scope of practice and are able to provide a wide range of clinical activities autonomously [24]. RNs are diploma or baccalaureate-educated nurses who can assess, manage, and treat patients, including patients with complex needs [25]. LPNs/RPNs are diploma-educated nurses who deliver routine care for stable patients [26]. Although primary care nurses carried out similar vaccination functions, the specific tasks varied by scope of practice; for example, only NPs and RNs identified high-priority patients, planned and organized vaccination clinics, or

monitored patients for adverse effects, while only NPs assessed patient risk profiles [21].

This study stemmed from an in-depth qualitative analysis of interview data gathered during the COVID-19 pandemic. We conducted semi-structured interviews [See Additional File 1] between May 2022 and January 2023. We employed a maximum variation sampling approach [27] to ensure diversity in participant characteristics, including gender, primary care settings, urban/rural locations, and various roles within primary care. We recruited participants in stages, assessed the characteristics and experiences of the sample recruited to date, and targeted underrepresented groups (e.g., men, rural nurses) in subsequent rounds of recruitment. Eligible participants were licensed to practice as NPs, RNs, or LPNs/RPNs during the pandemic and needed to be clinically active or eligible for clinical activity between 2020 and the interview date. Interview questions focused on the roles and functions nurses performed and experienced throughout the pandemic and also covered demographic information, such as gender, nursing status, practice type, employment duration, and care of dependents. Interviews were recorded and transcribed verbatim. In areas where ethics permitted, we used snowball sampling [28]. We continued recruitment of participants until data saturation was reached (i.e., until no further themes emerged in the data) [29]. Each participant received a $30 CAD honorarium.

Following data collection, using applied thematic analysis, seven members of the research team independently coded seven transcripts to create a coding template. After coding each transcript, we resolved conflicts in coding through discussion until we reached agreement, updated the template, and used the revised template to code the next transcript. This process continued until no new codes emerged [30, 31], resulting in a standardized coding framework to be used across all four regions. The research team then reviewed and sorted the data from the codes related to vaccination to identify recurring concepts. We discussed the meanings and relationships between these concepts [30, 31].

We maintained rigor through an audit trail using NVivo software (QSR International) for coding and audit trail management. We used member checking with participants during interviews to verify meaning and provide thick description (i.e., inclusion of context and explanatory details) in the presentation of quotations in the results to enhance the study clarity and credibility [30, 31]. We also enhanced study rigour with the involvement of experienced researchers throughout the process, from data collection to analysis and interpretation.

We obtained ethics approval from the Research Ethics Board of British Columbia, Western University Research Ethics Board, Nova Scotia Health Authority Research Ethics Board, and Health Research Ethics Board of Newfoundland and Labrador. All participants provided written informed consent prior to participating in an interview.

Positionality

We are an interdisciplinary team of primary care researchers with training in health administration, epidemiology, nursing, social work, anthropology, family medicine, and pharmacy. We adopted a pragmatic approach to carry out the study. Co-authors include nurses, family physicians, and a pharmacist involved in the pandemic response, including those providing vaccines. Through the discussion of themes and manuscript drafts, we arrived at a description and interpretation of findings that reflected the data and incorporated our individual viewpoints.

Results

From May 2022 to January 2023, 76 nurses (24 NPs, 37 RNs, and 15 LPNs/RPNs) completed interviews. The length of the interviews varied from 24 to 125 min (mean = 58 min). Women made up the majority of the study sample ($n = 72$; 94.7%), and 33 ($n = 43.4\%$) of participants worked in urban community settings (Table 1). The characteristics of the sample reflect the parameters of our maximum variation sampling strategy (i.e., gender, nursing designation, practice setting, nature of practice, location).

We identified five components of the vaccination rollout that influenced primary care nurses' perceptions and experiences: (1) information, (2) training, (3) coordination, (4) integration, and (5) compensation. When a component was well-considered by vaccination campaign organizers, it contributed to positive perceptions and experiences, but when it was poorly addressed, it contributed to negative perceptions and experiences. Some components (such as information about COVID-19 vaccines) improved over time while others (such as compensation) remained constant over time. The five components were identified by all nurse designations, as well as nurses who practiced in both rural and urban communities. Perceptions of each component varied by region, depending on the specific circumstances or stage of the vaccination campaign in each region.

Information

Participants stressed that the information about the COVID-19 vaccine was ever-changing. The constant evolution of information made it challenging to keep up-to-date, and sharing that new information with patients took time out of the day, making it difficult to balance the provision of patient care:

Table 1 Characteristics of study participants

Demographic Characteristics	British Columbia *N* = 13	Ontario *N* = 27	Nova Scotia *N* = 20	Newfoundland & Labrador *N* = 16	Total *N* = 76
Gender,n(%)					
Man or non-binary[a]	2 (15.4)	1 (3.7)	1 (5.0)	0 (0)	4 (5.3)
Woman	11 (84.6)	26 (96.3)	19 (95.0)	16 (100)	72 (94.7)
Nurse type, n (%)					
NP	2 (15.4)	9 (33.3)	8 (40.0)	5 (31.3)	24 (31.6)
RN	11 (84.6)	9 (33.3)	11 (55.0)	6 (37.5)	37 (48.7)
LPN/RPN	0 (0)	9 (33.3)	1 (5.0)	5 (31.3)	15 (19.7)
Clinic nature of practice[b], n (%)					
General family practice	13 (100.0)	22 (81.5)	19 (95.0)	15 (93.8)	69 (90.8)
Focused practice	0 (0)	5 (18.5)	1 (5.0)	1 (6.3)	7 (9.2)
Nurse nature of practice[c], n (%)					
General family practice	11 (84.6)	20 (74.1)	19 (95.0)	10 (62.5)	60 (78.9)
Focused practice	2 (15.4)	7 (25.9)	1 (5.0)	6 (37.5)	16 (21.1)
Community size, n (%)					
Rural	1 (7.7)	10 (37.0)	11 (55.0)	6 (37.5)	28 (36.8)
Small urban	3 (23.1)	5 (18.5)	6 (30.0)	0 (0)	14 (18.4)
Urban	9 (69.2)	12 (44.4)	3 (15.0)	9 (56.3)	33 (43.4)
Mixed[d]	0 (0)	0 (0)	0 (0)	1 (6.3)	1 (1.3)
Years in nursing practice, mean (SD)	17.7 (11.2)	13.6 (10.1)	15.6 (11.3)	14.0 (9.8)	14.9 (10.3)

Abbreviations: NP, nurse practitioner; RN, registered nurse; LPN/RPN, licensed practical nurse/registered practical nurse; SD, standard deviation

[a]Non-binary participants were grouped with men to protect confidentiality due to small numbers and to represent minority genders in our participant sample/the nursing profession

[b]Whether the clinic that the nurse works in serves a broad population or focuses on a specialized area, such as a specific patient population or medical condition (e.g., diabetes clinic, low-barrier walk-in clinic)

[c]Whether the nurse's role involves providing a broad range of services to the general population or focuses on a specialized area, such as a specific patient population or medical condition (e.g., chronic disease management, outreach work)

[d]Nurse worked at multiple sites with clinic populations that were a mixture of rural/urban/small urban

> *"That was challenging because there was a lot of changing and evolving information, so it was hard to stay on top of all the updates,... I would get a lot of appointments with just patients asking basic questions, like 'do I have any health conditions that would prohibit me from getting it' or 'what do you think about it'?... I found that was a bit muddy of where to get information" [NS-03-NP].*

One of the participant's primary care clinics provided written information about the COVID-19 vaccine near the beginning of the rollout; however, the information became out-of-date so quickly that they found themselves referring to other sources for updated advice: *"We used to give a little card out to everyone...[but] the information was changing so much that our managers felt it wasn't appropriate for us to be giving out information if it wasn't up-to-date. So, we referred [patients] to 8-1-1 [a general advice phone line run by the government]..."* [NL-07-LPN].

Some participants relied on their trusted sources (e.g., websites of regulatory bodies or organizations, reports or published material from scholarly sources, information relayed from other providers or within the nurses' community of practice, etc.) to obtain their information in order to stay up-to-date and facilitate their roles in vaccine education. In many instances, nurses sought out these sources independently, due to a gap in the consistency and timeliness of the information that was being provided to them: *"... we just used the best resources at the time from different specialties and gave that information along to the patients. Like the [Society of Obstetricians and Gynaecologists of Canada] had great documents published about the benefits of vaccination in pregnant women and we shared that with [pregnant patients]. They were the people who had the most questions."* [NL-14-NP].

Training

As part of their training to administer COVID-19 vaccines, nurses learned how to prepare and store the vaccine, the questions they were required to ask patients prior to giving the vaccine, and how to operate new computer programs used to track vaccine administration. Training around the COVID-19 vaccine presented challenges for study participants. The training was redundant for most primary care nurses, who often have extensive training and experience giving vaccines. Some nurses suggested training could be improved if it was focused

towards navigating the computer systems rather than the process of administering vaccines for those that already have the required training and competencies in this area: *"I don't need training on how to give the vaccine. I just need, how do you use the computer system and I'm good to go."* [ON-11-RPN].

Many nurses across the regions reported that they completed the required training modules to allow them to work with COVID-19 vaccines, but were never actually provided the opportunity to administer the vaccines: *"So, I did receive my training because the idea was that our primary care setting was going to be a setting that we were going to be able to give vaccination… but then it ended up not happening."* [ON-26-NP]. Additionally, a few nurses volunteered to staff COVID-19 mass vaccination sites but were never contacted, despite having the training and availability: *"I, many times offered to work in the vaccine clinics… They called for anyone who wants to help with the COVID response, please email. So, I did, multiple times and no one ever got back to me."* [NS-01-RN].

Coordination

Coordination played an important role in the organization and effectiveness of the vaccine rollout, and relates to the organized effort and systematic planning involved in distributing and administering vaccines to the population. This involved managing logistics, such as scheduling appointments, tracking those who have been vaccinated and those who still need doses, providing training and resources to healthcare providers, and facilitating communication between different healthcare entities. In the interviews, participants expressed varying perceptions regarding the coordination and organization of the COVID-19 vaccination rollout.

Participants' perceptions of the organization and coordination of the vaccine rollout varied within and across provinces, and were often based on additional factors, such as the vaccination setting and patient populations served. For example, a participant from BC who was involved in vaccine outreach to marginalized populations noted that the initial stages of the vaccination effort were poorly planned, particularly around the tracking and organization of who had and had not yet received doses:

> *"I think at a certain point when the vaccines came out, there was no plan for how we were going to vaccinate people.… how are we going to decipher whether our clients have got the vaccine and who's tracking it and how are we keeping track of it? And if clients aren't coming to the clinic, who's going to go give them their vaccine and make sure they got it and then what about their second dose and, now third dose, fourth dose?" [BC-11-RN].*

In contrast, another participant from BC who worked in a mass vaccination centre felt well-supported in the COVID-19 vaccine rollout: *"I feel pretty well-supported. I mean, we were pretty far into the pandemic when vaccinations started rolling out, so I think it was,… it was quite well organized"* [BC-06-RN]. This participant attributed the organization they experienced to having a supervisory nurse coordinating the operations of mass vaccination centres to which they were redeployed. In NL, a participant noted that primary care providers were engaged to increase vaccination efforts, but would have benefited from better collaboration with public health units that usually carried out vaccination:

> *"… [in NL] vaccination is a Public Health role. But because our [patients] are very vulnerable, we were doing it for them… We had to learn [about] all the different vaccines, we had to do the modules… but nobody ever came from Public Health [to provide help with training]… it was just like, 'Do it, go learn, go do it'" [NL-19-RN].*

In ON however, participants described strong collaboration with local public health units. Nurses from this province also relied on their local public health units when it came to education, training, organizing vaccine pickup/logistics, and providing vaccine information that was specific to the primary care nurse role. This helped support nurses with information and coordination surrounding the vaccine as well as provided continuous support regarding vaccine updates:

> *"They [the public health unit] did really, really great - all the way through from education, training on the electronic system that you needed for tracking purposes, organizing the pickup. But also tracking… usage, making sure that you had a really good understanding, depending on the vaccination type you got, how to make sure that it was preserved properly, used properly, and if you had any questions, they were very easy to get a hold of, which is surprising because they were so bogged down in general" [ON-05-RN].*

At the start of the vaccination effort, the desire to limit wastage complicated the coordination of vaccination appointments, as it often required appointments for vaccines to be scheduled in advance, with a certain number of patients scheduled at a time to ensure there were no left-overs:

> *"Early on in the vaccination effort, there is this real push to not waste a single dose. And so, when someone would not show up for an appointment, we'd*

kind of like, frantically be trying to replace them so that we wouldn't waste that last syringe" [ON-07-NP].

Participants noted that clinic organizers became more flexible over time, as it became clear that not every vaccine dosage could be tracked or accounted for:

"About a month after,... I think the Department learned that it was really difficult to keep ahead of what doses were going where, and we were losing doses, there were doses being wasted, so it was just sort of a make-work project" [NL-02-NP].

Participants had differing opinions of the coordination of the vaccination effort over time: *"... the information system started to... work a little better. At the beginning... there wasn't a lot of coordination"* [BC-10-RN]. Some participants suggested that coordination and clinic efficiency improved as individual clinics became more adaptable, for example, by allowing drop-in appointments: *"it went smoothly and patients booked ahead of time and then we had a few people drop in... and we were able to help them out too"* [NS-01-LPN]. Other participants felt, with the introduction of booster doses, coordination became worse, in part because of vaccine misinformation and miscommunication around eligibility:

"... there was so much misinformation or lack of information in the first stages that everybody had the same mantra, 'everybody's sticking to the science'.... And then there was the vaccination program and then after the second shot, there was all this miscommunication... So, it made our jobs very difficult because you would explain one process to the patients and then two weeks later Public Health or the Minister of Health would change their minds and it would be something totally different" [ON-02-RN].

Additionally, some participants suggested that the lack of coordination in the later stages of the vaccination program, especially after the introduction of boosters, may have been attributable to the waning interest in the COVID-19 pandemic. This was particularly relevant to certain settings and populations, such as community outreach, that were less coordinated than other response efforts in the early stages of the pandemic: *"... in the earlier phases of the pandemic, there was a lot more services than there are now... but for vaccinations specifically, it was like, 'you guys figure it out'"* [BC-11-RN].

Integration into primary care

Generally, primary care practices were not utilized to provide COVID-19 vaccines until the booster doses became available. There were logistical restraints to vaccinating in primary care contexts, such as challenges maintaining the vaccine cold chain (i.e., storage and handling) due to the lack of proper refrigeration, supply, and the limited window for vaccine vial usage. Clinics that had the proper refrigeration equipment were able to provide vaccinations in-house and nursing staff in these settings developed systems for ordering and managing the vaccine at these primary care settings:

"... we have a vaccine fridge here. So, we have COVID vaccines in our fridge. We'll just get a vial at a time. When we run out of that vial, we'll order another one. So, if anybody comes in now and says, 'Hey, I need my booster' we've got the ability to give it to them, which you will not find at any other clinic." [NL-19-RN].

Many practices, however, did not have refrigerators: *"we're a [physician-owned] clinic, we don't have the fancy vaccine fridges"* [NS-09-RN].

Participants in the study felt that integrating primary care practices earlier into the vaccine rollout would have provided improved access, especially for certain patients (e.g., those deemed to be high-risk) who did not feel comfortable going to a mass clinic: *"...A lot of people didn't want to go to the mass clinics, they wanted to go to their doctor's office. So, yeah, they definitely..., the government could have utilized us more in that sense earlier"* [ON-19-RPN] and *"I think we had more opportunity to immunize early because we had a fair number of patients that were not comfortable lining up in an arena"* [ON-20-NP].

Moreover, separating COVID-19 vaccination from the delivery of primary care reduced capacity for the latter: *"Running a vaccine clinic for a day or two or three or four meant that those are days that you're not seeing your primary care patients"* [ON-07-NP]. Most of the nurses interviewed noted that preventative care fell behind during the pandemic and that regular and catch-up appointments, combined with the demand for COVID-19 booster vaccines, made for a busier clinic: *"everybody's behind in their preventative care and everybody wants COVID shots...it's made everything busier"* [ON-19-RPN]. Integrating COVID-19 vaccination into routine care also improved the efficiency of patient visits: *"[it] got to the point that we were able to do vaccines kind of intertwined through the clinic day. So, there's a patient in for a diabetic visit or some other visit, we could offer them a COVID vaccine while they were there"* [ON-17-NP].

Compensation

Participants described compensation disparities between nurses and physicians and among different nursing professions who all performed the same vaccination tasks. Across provinces, participants noted that physicians were paid more than nurses to work at mass vaccination centres when they were doing the same job: *"... it was an issue that our compensation was not the same as physicians working in those sites"* [BC-14-NP]. One participant observed that, since administering vaccinations is within the scope of practice of all nurse designations, it would be more cost effective to utilize LPNs/RPNs for this role, given that NPs and RNs would be paid at a much higher rate to perform the same task:

> *"[T]o pay me as an NP what my hourly rate is compared to what you could pay an LPN,... I don't think that it was a good use of healthcare dollars to pay NPs and physicians their hourly rate, to be doing something that you could pay somebody less to do the same role" [NS-03-NP].*

Participants also noted that they were paid more if they worked at a mass vaccination centre than in their primary care clinic: *"... if we gave a vaccine here [at the primary care clinic], we get our same wage. If I went over there [to the vaccination clinic], I'd made $80 to give a shot in an hour"* [ON-16-RN]. Participants felt that the differences in vaccination compensation highlighted the inequities and inefficiencies in the vaccination rollout.

Discussion

Using qualitative interviews with primary care nurses in four regions in Canada, we identified five components that influenced the experiences and perceptions of the COVID-19 vaccination campaign in Canada: (1) information, (2) training, (3) coordination, (4) integration, and (5) compensation. These five components were identified by NPs, RNs, and LPNs/RPNs, despite variation in the specific tasks performed by each nursing designation [21]. These findings highlight the key components needed in a mass vaccination campaign that incorporates primary care and complements reviews which have summarized the key logistical components of mass vaccination clinics. The findings also support the need to address inequities related to remuneration of health professionals.

Our study findings echo the need to develop new strategies to efficiently review, manage, and convey relevant information to adequately approach vaccine misinformation [21, 32–34]. Study findings highlight the important role of primary care nurses as vaccinators in the COVID-19 vaccination campaign [5, 35–41]. They also underline the importance of the nurse's role in addressing vaccine misinformation through patient education, given their reputation as reliable and trustworthy sources of information about vaccine efficacy and side effects [5, 42–44].

Training for COVID-19 vaccine delivery posed administrative barriers to primary care nurses due to time requirements, redundancy, new electronic systems, and lack of opportunities to provide the vaccines, despite having completed the training and indicating their availability. Participants suggested streamlining training related to the COVID-19 vaccines and utilizing nurses based on their scope of practice and knowledge of vaccines. These results are consistent with a survey demonstrating that the majority of public health units in ON required six to fourteen days to train primary care providers to use the immunization database [45]. Some digital documentation systems, such as CANImmunize in NS, were better perceived, considered user-friendly, and placed emphasis on centralized vaccine booking and documentation to streamline vaccine access and delivery [39, 46]. Training is an important component in mass vaccination campaigns [5, 41]; our study suggests that training should be tailored to account for the existing skills of primary care nurses and should be focused on the unique characteristics of a novel vaccine (e.g., storage and stability, specific administration requirements) in order to limit the amount of time these providers would be pulled away from primary care duties.

In many communities, COVID-19 vaccines were not routinely available in primary care settings until boosters were available. The need for rapid, mass vaccination and the logistical and storage requirements of the COVID-19 vaccines in the early stages of the vaccination campaign limited the ability of nurses to provide vaccines in primary care settings. However, for some high-risk individuals, primary care clinics were a more accessible and comfortable location [5, 21, 47]. Primary care clinics are often conveniently located within communities, enhancing accessibility and promoting vaccine uptake for high-risk individuals. Moreover, the trust between primary care providers and patients also promotes vaccine uptake among vaccine hesitant patients [21, 48–50]. Future pandemic plans should integrate primary care earlier in the vaccination campaign to enhance the vaccination rates of high-risk patients and promote equity [27, 42, 43].

The vaccination campaign also highlighted inequities in compensation between and within health professions. Moreover, higher compensation offered through mass vaccination centres may have drawn primary care nurses away from primary care settings, further reducing primary care capacity [48, 51]. A 2022 report [45] noted that vaccinators in the ON COVID-19 vaccine rollout received varying levels of pay based on their health profession and whether the vaccine was administered in a hospital, public health facility, or privately. Specifically, in locations run by public health units and hospitals,

doctors were paid $170-$220 per hour to vaccinate patients, compared to $32-$49 for nurses and $30-$57 for pharmacists [45]. These findings highlight the overlapping scopes of practice of healthcare providers involved in the mass vaccination campaign and underscores the need for better planning for human resource needs during the pandemic. For example, both Canada and the UK introduced workforce regulations to permit more healthcare professions to provide COVID-19 vaccinations [5, 52].

Limitations

Participant responses may be prone to recall bias [53] given that participants were asked to reflect on their experiences during earlier pandemic stages. There may have also been a social desirability bias [54], particularly if participants held vaccine hesitant views or were not supportive of vaccination efforts in general. These risks were mitigated through the use of skilled interviewers, carefully crafted interview guides, and descriptions of the pandemic stages to enhance recall. Additionally, although maximum variation sampling was used and recruitment was deliberate to capture a broad range of characteristics, our findings may not accurately reflect the experiences of all primary care nurses or those in other Canadian regions where pandemic responses may have differed.

Conclusions

Perceptions of the Canadian COVID-19 vaccine rollout among primary care nurses were influenced by five key components: information about COVID-19 vaccines, training, coordination, integration into primary care, and compensation. While previous studies have described the functions and tasks of primary care nurses in the COVID-19 vaccination effort, our findings highlight key considerations to optimize the role and satisfaction of primary care nurses in both pandemic and routine vaccination campaigns. Future mass vaccination efforts and pandemic response planning should take these factors into account to improve the reach and efficiency of these vaccination initiatives.

Abbreviations

NACI	National Advisory Committee on Immunization
BC	British Columbia
ON	Ontario
NS	Nova Scotia
NL	Newfoundland and Labrador
NP	Nurse Practitioner
RN	Registered Nurse
LPN/RPN	Licensed Practical Nurse/Registered Practical Nurse

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-02747-8.

Supplementary Material 1

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Author contributions

Writing – Original Draft: RL, MM; Writing – Review and Editing: LH, EGM, JL, JEI, JW, ED, LM, DR, SS, CV, CC; Methodology: MM, LH, EGM, JL, ED, DR, LM, SS; Formal Analysis: MM, LM, DR, SS, CV, ED; Supervision: MM, LH, EGM, JL; Project Administration: MM, LM, LH, SS, EGM, JL, DR; Funding Acquisition: MM, LH, EGM, JL, JEI, JW, CC. All authors have read and approved the final manuscript.

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Data availability

The datasets analysed during this study are not publicly available due to the need to maintain participant confidentiality; however, a portion of these data may be available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethics approval was obtained from Research Ethics Board of British Columbia (File: H20-02998), Health Research Ethics Board of Newfoundland and Labrador (File: 20222815), Nova Scotia Health Authority Research Ethics Board (File: 1027959), and the Western University Research Ethics Board (File: 120519). Participants provided informed consent before interviews were scheduled. All methods in this study were performed in accordance with the relevant ethical guidelines and regulations.

Consent for publication

Not applicable.

Conflict of interest

The authors declare that they have no competing interests.

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References

1. Canadian Institute for Health Information. Canadian COVID-19 intervention timeline. CIHI. 2022. https://www.cihi.ca/en/canadian-covid-19-intervention-timeline. Accessed Sept 25, 2024.

2. Kholina K, Harmon SHE, Graham JE. An equitable vaccine delivery system: lessons from the COVID-19 vaccine rollout in Canada. PLoS ONE. 2022;17(12):e0279929. https://doi.org/10.1371/journal.pone.0279929.
3. Public Health Agency of Canada. (2022). Canada's COVID-19 vaccine supply and donation strategy. Government of Canada. 2022. https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19/vaccines/supply-donation.html. Accessed Sept 25, 2024.
4. Ismail SJ, Zhao L, Tunis MC, Deeks SL, Quach C. Key populations for early COVID-19 immunization: preliminary guidance for policy. CMAJ. 2020;192(48):e1620–32. https://doi.org/10.1503/cmaj.202353.
5. Aggarwal M, Kokorelias KM, Glazier RH, Katz A, Shiers-Hanley JE, Upshur REG. What is the role of primary care in the COVID-19 vaccine roll-out and the barriers and facilitators to an equitable vaccine roll-out? A rapid scoping review of nine jurisdictions. BMJ Open. 2023;13(4):e065306. https://doi.org/10.1136/bmjopen-2022-065306.
6. Hasan T, Beardsley J, Marais BJ, Nguyen TA, Fox GJ. The implementation of mass-vaccination against SARS-CoV-2: a systematic review of existing strategies and guidelines. Vaccines. 2021;9(4). https://doi.org/10.3390/vaccines9040326.
7. Government of Canada. COVID-19 Vaccination: doses administered. 2024. https://health-infobase.canada.ca/covid-19/vaccine-administration/. Accessed Sept 25, 2024.
8. Fitzpatrick T, Camillo CA, Hillis S, Habbick M, Mauer-Vakil D, Roerig M, et al. Comparison of COVID-19 vaccination rollout approaches across Canada: case studies of four diverse provinces. Health Reform Obs. 2023;11(1). https://doi.org/10.13162/hro-ors.v11i1.5118.
9. BBC. Why Canada is falling behind in COVID vaccinations. 2021. https://www.bbc.com/news/world-us-canada-56035306. Accessed Sept 25, 2024.
10. Treble P. Pfizer's COVID vaccines are delayed in Canada. What exactly is the hold-up? Macleans. 2021. https://macleans.ca/news/why-is-there-a-hold-up-with-pfizers-covid-vaccines/. Accessed Sept 25, 2024.
11. Vernon-Wilson E, Tetui M, Nanyonjo A, Adil M, Bala A, Nelson D, et al. Unintended consequences of communicating rapid COVID-19 vaccine policy changes – a qualitative study of health policy communication in Ontario, Canada. BMC Pub Health. 2023;23(1):932. https://doi.org/10.1186/s12889-023-15861-y.
12. Bardosh K, de Figueiredo A, Gur-Arie R, Jamrozik E, Doidge J, Lemmens T, et al. The unintended consequences of COVID-19 vaccine policy: why mandates, passports and restrictions may cause more harm than good. BMJ Glob Health. 2022;7(5):e008684. https://doi.org/10.1136/bmjgh-2022-008684.
13. Duong D. Canadian physicians frustrated with vaccine rollout. CMAJ. 2021;193(13):e458–9. https://doi.org/10.1503/cmaj.1095929.
14. Guay M, Maquiling A, Chen R, Lavergne V, Baysac D-J, Racine A, et al. Measuring inequalities in COVID-19 vaccination uptake and intent: results from the Canadian Community Health Survey 2021. BMC Pub Health. 2022;22(1):1708. https://doi.org/10.1186/s12889-022-14090-z.
15. Muhajarine N, Adeyinka DA, McCutcheon J, Green KL, Fahlman M, Kallio N. (2021). COVID-19 vaccine hesitancy and refusal and associated factors in an adult population in Saskatchewan, Canada: evidence from predictive modelling. PLoS ONE. 2021;16(11):e0259513. https://doi.org/10.1371/journal.pone.0259513
16. Arya N, Redditt VJ, Talavlikar R, Holland T, Brindamour M, Wright V, et al. Caring for refugees and newcomers in the post–COVID-19 era: evidence review and guidance for FPs and health providers. Can Fam Physician. 2021;67(8):575–81. https://doi.org/10.46747/cfp.6708575.
17. Gerges S, Gudzak V, Bowles S, Logeman C, Fadaleh SA, Bucci LM, et al. Experiences of community pharmacists administering COVID-19 vaccinations: a qualitative study. Can Pharm J. 2023;156(1). https://doi.org/10.1177/17151635221136552.
18. Devereaux A, McPherson C, Etowa J. Public health nurses' experiences during the H1N1/09 response. Pub Health Nurs. 2020;37(4):533–40. https://doi.org/10.1111/phn.12749.
19. Hodge J. Canadian healthcare workers' experiences during pandemic H1N1 influenza: Lessons from Canada's response. A review of the qualitative literature. National Collaborating Centre for Infectious Diseases. 2015. https://nccid.ca/wp-content/uploads/sites/2/2015/03/HCW_H1N1_Lessons_E.pdf. Accessed Sept 25, 2024.
20. Lam SKK, Kwong EWY, Hung MSY, Pang SMC, Chiang VCL. Nurses' preparedness for infectious disease outbreaks: a literature review and narrative synthesis of qualitative evidence. J Clin Nurs. 2018;27(7–8):e1244–55. https://doi.org/10.1111/jocn.14210.
21. Lyons R, Mathews M, Ryan D, Hedden L, Lukewich J, Marshall EG, et al. A qualitative analysis of the functions of primary care nurses in COVID-19 vaccination. J Adv Nurs. 2024. [online ahead of print]. https://doi.org/10.1111/jan.16468
22. Mathews M, Spencer S, Hedden H, Marshall EG, Lukewich J, Buote R, et al. Development of a primary care pandemic plan informed by in-depth policy analysis and qualitative case studies with family physicians across Canada during COVID-19: a qualitative case study protocol. BMJ Open. 2021;11:e048209. (e1-8).
23. Mathews M, Meredith L, Ryan D, Hedden L, Lukewich J, Marshall EG, et al. The roles of family physicians during a pandemic. Healthc Manage Forum. 2023;36(1):30–5.
24. Canadian Institute for Health Information. Nurse Practitioner scopes of practice vary across Canada's provinces and territories. CIHI. n.d. https://www.cihi.ca/en/nurse-practitioner-scopes-of-practice-vary-across-canadas-provinces-and-territories. Accessed Jan 15, 2025.
25. Canadian Nurses Association. Framework for the practice of registered Nurses in Canada. CNA. 2015 https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/rn-practice-framework2. Accessed Jan 15, 2025.
26. Canadian Institute for Health Information. Legislated scopes of practice across Canada: Licensed Practical Nurses. CIHI. n.d. https://www.cihi.ca/en/legislated-scopes-of-practice-across-canada-licensed-practical-nurses. Accessed Jan 15, 2025.
27. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Adm Policy Ment Health. 2015;42(5):533–44. https://doi.org/10.1007/s10488-013-0528-y.
28. Kirchherr J, Charles K. Enhancing the sample diversity of snowball samples: recommendations from a research project on anti-dam movements in Southeast Asia. PLoS ONE. 2018;13(8):e0201710. https://doi.org/10.1371/journal.pone.0201710.
29. Creswell JW. Research design: qualitative, quantitative, and mixed methods approaches. 4th ed. Thousand Oaks: SAGE Publications Ltd.; 2014.
30. Berg BL. Qualitative research methods for the social sciences. 2nd ed. Allyn and Bacon; 1995.
31. Guest G, MacQueen KM, Namey EE. Applied thematic analysis. Los Angeles: SAGE Publications Ltd.; 2012.
32. Embrett M, Packer TL, Fitzgerald E, Jaswal SK, Lehman MJ, Brown M, et al. The impact of the COVID-19 pandemic on primary care physicians and nurses in Nova Scotia: a qualitative exploratory study. CMAJ Open. 2023;11(2):e274–81. https://doi.org/10.9778/cmajo.20210315.
33. Manby L, Dowrick A, Karia A, Maio L, Buck C, Singleton G, et al. Healthcare workers' perceptions and attitudes towards the UK's COVD-19 vaccination program: a rapid qualitative appraisal. BMJ Open. 2022;12:e051775. https://doi.org/10.1136/bmjopen-2021-051775.
34. Young G, Mathews M, Hedden L, Lukewich J, Marshall EG, Gill P, et al. Swamped with information: a qualitative study of family physicians' experiences of managing and applying pandemic-related information. Front Commun. 2023;8:1186678. https://doi.org/10.3389/fcomm.2023.1186678.
35. Ashcroft R, Donnelly C, Lam S, Sheffield P, Hamilton B, Kemp C, et al. A qualitative examination of primary care team's participation in the distribution of the COVID-19 vaccination. BMC Prim Care. 2024;25(85). https://doi.org/10.1186/s12875-024-02327-2.
36. Couper K, Murrells T, Sanders J, Anderson JE, Blake H, Kelly D, et al. The impact of COVID-19 on the wellbeing of the UK nursing and midwifery workforce during the first pandemic wave: a longitudinal survey study. Int J Nurs Stud. 2022;127:104155. https://doi.org/10.1016/j.ijnurstu.2021.104155.
37. Haldane V, Zhang Z, Abbas RF, Dodd W, Lau LL, Kidd MR, et al. National primary care responses to COVID-19: a rapid review of the literature. BMJ Open. 2020;10(12):e041622. https://doi.org/10.1136/bmjopen-2020-041622.
38. Kearon J, Risdon C. The role of primary care in a pandemic: reflections during the COVID-19 pandemic in Canada. J Prim Care Comm Health. 2020;11:e2150132720962871. https://doi.org/10.1177/2150132720962871.
39. Kiran T, Eissa A, Mangin D, Bayoumi I, Ivers N, Newbery S et al. Brief on primary care part 1: the roles of primary care clinicians and practices in the first two years of the COVID-19 pandemic in Ontario. Ontario COVID-19 Science Advisory table 2022. https://doi.org/10.47326/ocsat.2022.03.67.1.0. Accessed Sept 25, 2024.
40. Kraus M, Stegner C, Reiss M, Riedel M, Børsch AS, Vrangbaek K, et al. The role of primary care during the pandemic: shared experiences from providers in five European countries. BMC Health Serv Res. 2023;23(1):1054. https://doi.org/10.1186/s12913-023-09998-0.

41. Shakory S, Eissa A, Kiran T, Pinto AD. Best practices for COVID-19 mass vaccination clinics. Annals Fam Med. 2022;20(2):149–56. https://doi.org/10.1370/afm.2773.
42. Ontario College of Family Physicians. With vaccines coming, family doctors could jab millions more if fully involved. OCFP. 2021. https://www.newswire.ca/news-releases/with-vaccines-coming-family-doctors-could-jab-millions-more-if-fully-involved-851073212.html. Accessed Sept 25, 2024.
43. Wilkinson E, Jetty A, Petterson S, Jabbarpour Y, Westfall JM. Primary care's historic role in vaccination and potential role in COVID-19 immunization programs. Ann Fam Med. 2021;19(4):351–5. https://doi.org/10.1370/afm.2679.
44. Ontario Medical Association. Ontario's doctors thank the premier, ready to expand vaccine role. OMA. 2021. https://www.oma.org/newsroom/news/2021/mar/ontarios-doctors-thank-the-premier-ready-to-expand-vaccine-role/. Accessed Sept 25, 2024.
45. Office of the Auditor General of Ontario. Value-for-money audit: COVID-19 vaccination program. 2022. https://www.auditor.on.ca/en/content/annualreports/arreports/en22/AR_COVIDVaccination_en22.pdf. Access Sept 25, 2025.
46. Dempsey A. An Ontario company built Canada's best vaccine booking system… for Nova Scotia. Toronto Star. 2021. https://www.thestar.com/news/gta/an-ontario-company-built-canada-s-best-vaccine-booking-system-for-nova-scotia/article_8a069eeb-fc6d-5f17-b387-78ff4c5ad9c1.html.Accessed Sept 25, 2024.
47. Spencer S, Hedden L, Vaughan C, Marshall EG, Lukewich J, Asghari S, et al. It was horrible for that community, but not for the way we had imagined: a qualitative study of family physicians' experiences working with communities experiencing marginalization during COVID-19. SSM Qual Res Health. 2022;2(100176):1–9. https://doi.org/10.1016/j.ssmqr.2022.100176.
48. Mathews M, Ryan D, Hedden L, Lukewich J, Marshall EG, Buote R, et al. Strengthening the integration of primary care in pandemic response plans: a qualitative interview study of Canadian family physicians. Br J Gen Pract. 2023;73(730):e348–55. https://doi.org/10.3399/BJGP.2022.0350.
49. Nowak DA, Sheikhan NY, Naidu SC, Kuluski K, Upshur REG. Why does continuity of care with family physicians matter? Can Fam Physician. 2021;67:679–88.
50. Shen S, Dubey V. Addressing vaccine hesitancy – clinical guidance for primary care physicians working with parents. Can Fam Physician. 2019;65:175–81.
51. Lukewich J, Bulman D, Mathews M, Hedden L, Marshall EG, Vaughan C, et al. Redeployment among primary care nurses during the COVID-19 pandemic: a qualitative study. SAGE Open Nurs. 2024;10. https://doi.org/10.1177/23779608241262143.
52. Ontario Ministry of Health. Executive officer notice: administration of publicly funded COVID-19 vaccines in Ontario pharmacies. Government of Ontario. 2024. https://www.ontario.ca/files/2024-04/moh-executive-officer-notice-en-2024-04-15.pdf Accessed Sept 25, 2024.
53. Coughlin SS. Recall bias in epidemiologic studies. J Clin Epidemiol. 1990;43(1):87–91. https://doi.org/10.1016/0895-4356(90)90060-3.
54. Bergen N, Labonté R. "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. Qual Health Res. 2020;30(5):783–92. https://doi.org/10.1177/1049732319889354.

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