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Optimal Staffing in Community Health Centers to Improve Quality of Care

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Introduction

Community health centers (CHCs) are important safety net providers. In 2016, 1,367 federally-funded CHCs served 26 million patients or 1 in 12 Americans.[1,2] Health centers are a rapidly growing part of the health care system and they experienced a one-third increase in patient volume nationwide from 2010 to 2016.[3] Meanwhile, researchers have documented significant changes in CHC workforce, with more advanced practice clinicians (APCs) each year.[4] Despite the growing importance of APCs in the CHC workforce, physicians remain the largest marginal contributor to the volume of services delivered at CHCs.[4] Workforce composition is also likely to be an important contributor to quality of care at CHCs, yet it is less studied. To date, only a handful studies examined the quality of care at community health centers.[5–9]

Methods

Using 2014-2016 data from the Uniform Data System (UDS) combined with IRS Form 990 Nonprofit Organization Tax Return data and BLS Occupational Employment Statistics, we conducted multivariate regression analysis to understand the impact of medical workforce configuration on quality of care, volume of services, and revenue. We excluded 294 observations from government and tribe-operated CHCs and 300 observations that did not file either a Form 990 or Form 990 EZ. We also excluded the top one percent of centers in terms of per encounter staff and capital utilization. This resulted in a sample of 3,149 observations from 1,182 grantees.

We modeled one quality outcome: the average percent of patients with diabetes who have controlled A1C level (<9%) and patients with hypertension who have controlled blood pressure (140/90 mm Hg); one volume outcome: total number of encounters; and one revenue outcome: total revenue (patient-related revenue and grants combined). We employed a generalized production function approach using six input factors: 1) primary care physicians (PCPs), 2) APC, 3) other medical support staff, 4) administrative staff, 5) enabling staff, and 6) capital. All labor input factors are measured in full-time equivalents and capital expenditures are measured in $100,000 units. We estimated a quality production function with input factors and controlled for level of volume of services (visits), a quantity production function with input factors to explore the potential indirect effect of input factors has on quality of care (through volume of services), and a revenue function to explore the complementarity and substitutability between input factors. We incorporated covariates, including CHC patient payor mix, patient demographics, and county level uninsured and poverty

Key Findings

1. This study provides evidence that health workforce is an important factor in promoting quality of care. PCPs and APCs are most important contributors to quality of care and they are similarly effective in improving quality of care as measured by an index of chronic condition management. Yet, PCPs generate higher volume of services compared to APCs. Further, PCP services are valued more by payors and grant-making entities compared to APC services.
2. No single investment strategy in health workforce and capital would be the best for all CHCs; however, a majority would benefit from more APCs.
3. In a scenario with added investments, CHCs that have a best strategy characterized by hiring “mainly APCs” or “APCs and nurses” are associated with a smaller patient population, less complex patients, in non-metropolitan areas, and in Medicaid expansion states.

rate. We controlled for center and year fixed effects, with standard errors clustered at the center level. To understand how to improve quality of care in CHCs in the most cost-effective way, we then conducted a simulation-based cost-effectiveness analysis using parameters estimated from the regression analysis. The scenario was defined as all CHCs receiving a $1 million subsidy to improve their quality through workforce additions or capital investments. Each center was set to maximize its quality outcome based on its current workforce configuration, capital stock, and the relative cost-effectiveness of each provider profession and capital in that center. Subsequently, a latent profile analysis was conducted to categorize CHCs' best investment strategies (i.e. combination of factors) in terms of maximizing quality. A multinomial logit model was used to explore non-workforce CHC characteristics and county characteristics associated with the simulated best strategy.

Findings

Over the study period, the average quality score was 63.9% of patients with diabetes or hypertension with their conditions under control, the average number of visits was 70,169, and the average revenue was $15.5 million per center. Table 1 presents the marginal effects of adding 1 FTE of each provider profession or investing $100,000 in capital on quality, volume, and revenue from the regression analysis. Most importantly, the direct quality effects of an additional PCP (0.241 % pts) and APC (0.244 % pts) were nearly identical. Their indirect and total quality effects were also very similar. Yet, the marginal effect on volume of services of each additional PCP (1,795 visits) was 25% higher than that of an additional APC (1,440 visits), whereas the marginal effect on revenue of an additional PCP ($329,409) was 70% higher than that of an additional APC ($193,598). Additional analysis of the revenue function showed that 1) PCPs and APCs were substitutes and 2) PCPs and other medical support staff were complements in the CHC production process. The complementarity and substitutability between other pairs of input factors were inconclusive. On average, the hypothesized $1 million investment in each center would improve the quality score by 5.1 percentage points, while total volume of visits increased by ten thousand. The latent profile analysis found four types of investment combinations: hiring mainly APC (65% of CHCs), hiring mainly APCs and nurses (8%), hiring mainly nurses and administrative staff and investing in capital (12%), and hiring mainly PCPs and nurses (15%). Figure 1 presents the combinations of workforce inputs hired and capital investments within each strategy. CHCs under "mainly APCs" hiring strategy would hire about 8 APCs and 0.2 nurses, whereas CHCs under "mainly PCPs and nurses" would hire about 3.5 physicians and about 0.7 nurses. A multinomial logit model (available upon request) showed that CHCs that have a best strategy characterized by hiring "mainly APCs" or "APCs and nurses" are associated with a smaller patient population, less complex patients, in non-metropolitan areas, and in Medicaid expansion states.

Conclusion

This study provides evidence that health workforce was an important factor in promoting quality of care. PCPs and APCs are the most important contributors to quality of care and were similarly effective in improving quality of care measured as chronic condition management examined in this analysis. Consistent with previous GW HWRC studies, PCPs in centers generated higher volume of services compared to APCs.[4] PCP services appeared to be more highly valued by payors and grant-making entities than APC services, too. Consistent with a recent Macy Foundation report, nurses are projected to be an integral component of all four investment strategies.[10] Enabling staff (part of administrative staff) contribute to the volume of services by improving access to care; yet, there appears to be a watering down effect on quality of care, potentially because their effort links the sicker population to care. While a majority of CHCs would be best served by hiring more APCs to improve quality of care, no single strategy fits all centers.

Policy Implications

Hiring APCs is the most cost-effective option for many CHCs for quality improvement and policies that increase the supply of APCs would help CHCs. The National Health Service Corp is an important vehicle for increasing supply for APCs.

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No single investment strategy is best for all CHCs. Policies that allow CHCs flexibility in quality improvement strategies are likely to be the most effective overall. However, the potential guiding principles from this analysis might be translated to methods for creating a tool to potentially help CHCs plan their investment in health workforce.

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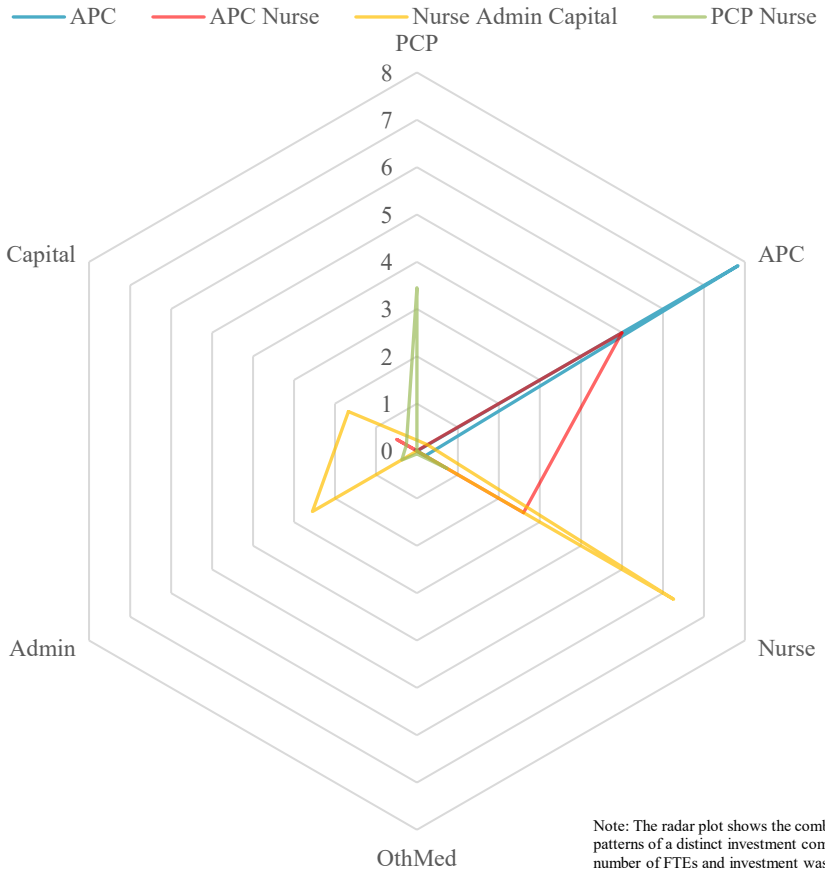
Table 1 Marginal Effects of Provider Profession and Capital Investment

	Direct Quality Effect (% pts)	Indirect Quality Effect (% pts)	Total Quality Effect (% pts)	Volume Effect (1,000 visits)	Revenue Effect ($)
PCP	0.241*	0.061*	0.302**	1.795***	329,409***
	(0.132)	(0.037)	(0.130)	(0.201)	(41,238)
APC	0.244*	0.049*	0.293**	1.440***	193,598***
	(0.136)	(0.029)	(0.132)	(0.163)	(32,474)
Nurse	0.071	0.010	0.082	0.308***	65,410***
	(0.069)	(0.007)	(0.070)	(0.094)	(16,251)
OthMed	-0.024	0.003	-0.022	0.078	40,535***
	(0.038)	(0.003)	(0.038)	(0.090)	(9,242)
Admin	-0.065*	0.004	-0.061	0.129**	55,649***
	(0.040)	(0.003)	(0.040)	(0.061)	(12,118)
Capital	0.036	0.006	0.042	0.185*	66,685***
	(0.074)	(0.005)	(0.073)	(0.102)	(21,261)

Standard errors derived from delta method in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1
Note: Table presents the marginal effects of adding 1 FTE in each provider profession or investing $100,000 in capital at sample means. Results are derived from multivariate production function regression analysis.

Figure 1. Investment Combination to Maximize Chronical Conditions Management



Note: The radar plot shows the combination of average hiring/investing patterns of a distinct investment combination. Hirings were shown as number of FTEs and investment was shown in $100,000.

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