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Residency training in family medicine and its impact on coordination and continuity of care: an analysis of referrals to secondary care in Rio de Janeiro

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ABSTRACT

Objective To measure the effect that residency training in family medicine (RTFM) has on continuity and coordination of care.

Design Observational cohort study using electronic health records.

Setting Rio de Janeiro, Brazil, public primary care system.

Participants 504 940 patients, 633 generalists (physicians without RTFM) and 204 family physicians (FP—doctors with 2 years of RTFM) from one health district between January 2015 and December 2018.

Intervention Two years of RTFM.

Main outcome measures Relative risks of patients being referred to secondary care for outpatient consultations and diagnostics tests; and having a follow-up medical consultation in primary care within 3 and 6 months after being referred.

Results We examined 2 414 508 medical consultations and 284 754 referrals to secondary care. FPs were less likely to request ambulatory care services (including surgical specialties), but were more likely to request ophthalmology, physiotherapy, rehabilitationand surgical evaluations for their patients. Patients referred to secondary care by FPs were more likely to have a follow-up visit in primary care for almost every service requested. If all medical consultations were performed by FPs, a 37.6% (95% CI 32.4% to 42.4%) increased demand for rehabilitation services would be noticed. Oppositely, 1532 (95% CI 1458 to 1602) fewer requests for dermatology would happen every year.

Conclusions RTFM improves coordination and continuity of care by making FPs more competent to retain those health conditions that can be properly managed in primary care and making FPs more competent to detect health conditions that require specific biomedical technologies and skills, increasing the demand for those services. Besides, it increases the chances of patients having follow-up visits in primary care. Policy-makers in low-income and middle-income countries must consider investing in RTFM to make primary care systems more comprehensive, with better coordination and continuity of care.

Strengths and limitations of this study

- To our knowledge, our article is the first study to address the impact of residency training in family medicine on promoting continuity and coordination between primary and secondary levels of healthcare in low-income and middle-income countries.
- We drew on data from electronic health records, which reflect real-world clinical practice in the public primary care system in Brazil, and using mixed-effects models allowed us to take into account the correlation among consultations from the same patient.
- Our analyses are limited to comparisons on patterns of referrals and follow-ups between generalists and family physicians and we cannot infer that patients are getting a better quality of care, having better quality of life or living longer.
- Having the full information about doctors' individual and educational characteristics would have helped to better measure the role that residency training in family medicine plays in promoting the attributes of primary healthcare (PHC).
- The evidence raised from primary care and family medicine in Brazil can be better translated to other low-income and middle-income countries that are facing similar troubles training the healthcare workforce and developing comprehensive PHC systems.

INTRODUCTION

For the last 40 years, improvements in primary healthcare (PHC) were made worldwide due to the momentum created by the Alma-Ata declaration.[1] Many countries have achieved good results in creating and developing universal, accessible and cost-effective PHC systems.[2 3] Today, we have enough evidence supporting the notion that countries with strong PHC have better health indicators,[4] have reduced health inequalities[5] and get better results while spending less money.[6]

With a large universal public healthcare system[7] and a successful history of community-based PHC,[8] Brazil has been portrayed as an example to be followed by low-income and middle-income countries (LMICs). The Family Health Strategy (Estratégia de Saúde da Família—FHS) launched by the federal government in 1994, established a structure for PHC at the municipal level, providing financial resources for family health teams (FHTs) formed by one physician, one nurse, one nurse assistant and four to six community health workers (CHWs) to provide care for up to 4000 people living in a given catchment area. This initiative has substantially reduced infant and neonatal mortality,[9] hospital admissions related to ambulatory care sensitive conditions[10–13] and cardiovascular deaths.[14 15] Today 43 000 FHTs provide public-funded community-based PHC to 64% of the Brazilian population covered by the FHS.[16] However, many of these FHTs have only a nurse and CHW as healthcare providers and, when a doctor is available, it is very unlikely to be a trained family physician (FP). After 6 years of medical school, any physician can work in primary care right after getting his/her medical degree.

Despite recent policies that have tried to boost the creation and growth of residency programmes in family medicine (FM) in Brazil,[17 18] only 4.4% of the residency seats are dedicated to FM. With only 5500 FP in the country[19] (1.4% of all medical specialists), FM is still not seen by policymakers and health managers as a necessary medical specialty for doctors working in PHC.[20]

Between 2008 and 2016, the Rio de Janeiro Municipal Health Department (RJ-MHD) expanded the FHS coverage from 3.5% to 70% in the city and allocated financial incentives for capacity building of human resources in FM.[21] A new FM residency training programme was created and two established programmes were expanded.[22 23] The rationale behind this initiative was that the investments made in residency training in FM (RTFM) would be translated into a more qualified provision of PHC with a wider scope of practice and better use of health resources.[24]

Measuring the impact that RTFM can make in promoting the attributes of PHC can be a hard task due to its characteristics, complexity and broad scope of practice, making it necessary to approach one aspect at a time. With FPs and Generalists (physicians without RTFM) working side by side for the last 10 years, the city of Rio de Janeiro can be a unique case study to address important research questions about the development of human resources for PHC in LMIC.[25]

This study analyses the impact of RTFM on two key attributes of PHC—continuity and coordination of care—by testing the hypothesis that trained FPs will be less likely to refer their patients to secondary care (SC), but will be more likely to provide follow-up visits for patients once referred. It aims to compare FPs and generalists performance by measuring (1) the risk of their patients being referred to SC for outpatient consultations and diagnostic tests; (2) the likelihood of those patients having a follow-up medical consultation in PHC within 3 and 6 months after being referred. Finally, it aims (3) to determine the population attributable fractions (PAFs) in a scenario in which all medical consultations and referrals were carried out by FPs.

METHODS

Study design and data source

We conducted a retrospective longitudinal observational analysis of medical consultations in PHC and referrals to SC. This sample combines information from 504 940 patients (205 961 men and 298 508 women), 2 414 508 medical consultations, 284 754 referrals to SC and 837 physicians working non-concurrently in one health district between January 2015 and December 2018. The reasons for choosing that particular health district were that 15% of the city's population lives in this region and 25% of the FHTs had a FP in place. Moreover, there were five different electronic health record systems in the city at that point and it was necessary to concentrate efforts for data processing on a specific one. Patients' consent was not necessary since only anonymised information was used during the study and the RJ-MHD, the actual caretaker of this information, gave the consent to use this dataset for this research.[26] Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Exposure

Physicians were divided into two categories: (1) Generalists—the reference category aggregating doctors without RTFM and (2) FPs—graduated FPs, FM preceptors and residents enrolled in the FM residency programmes. Residents in FM were included in the same category as FP because they spend 2 years working 48 hours a week in a community-based primary care clinic under the full supervision of a senior FP (FM preceptor), sharing responsibilities for the same patients in one FHT. Every week they have learning sessions developed by the faculty members[23] using active learning methods[27 28] to address topics of FM and PHC, such as clinical reasoning, management of the most prevalent health conditions in PHC, communication skills, evidence based-medicine, PHC and healthcare systems, vulnerable populations, elderly care, multimorbidity, polypharmacy, among others.[29] They also have rotations in maternal care, paediatrics, internal medicine and emergency care. These activities were designed in line with the National Committee for Medical Residencies[30] and with the Brazilian Society of Family and Community Medicine.[31] Information about other forms of postgraduate training were not available in the database and were not taken into account, nor the number of years in practice for any doctor.

Independent variables

Every patient contributed to the models with individual information—(1) age (linear), (2) sex and (3) the

Charlson Comorbidity Index (CCI)[32]—and contextual information—(4) the Social Development Index (SDI). The SDI is a linear scale combining information about sanitation, schooling, income and housing conditions from every household in the FHT catchment area, representing the grade of social development of a neighbourhood.[33] Hence, patients registered in the same FHT have the same SDI. It varies from 0 (least developed) to 1 (most developed).

CCI[32] was used to add information about patients' morbidity burden to the models, assuming that those with more chronic conditions would be more likely to be referred to SC and have follow-up consultations after being referred.

Time effects were regarded using dummy variables for months and years in all models. A dummy variable was used to include information identifying if the consultation was a prenatal care visit or not.

All clinics in this sample have the same physical structure, offices equipped with computer, printer, medical equipment, room for small surgical procedures, the same arsenal of laboratory tests and medicines in the pharmacy, and the same type of human resources available: nurses, technicians, dentists, pharmacists and managers. The availability of medical specialties in SC and diagnostics tests, and the referral procedures are the same for all doctors and clinics in the sample. The distribution of doctors among different clinics and FHT didn't follow any criteria that could interfere in the relationship between the medical categories, the population assisted and the study outcomes.

Outcomes

Referrals to SC were divided into three groups: (1) outpatient consultations for ambulatory care; (2) surgical evaluation and (3) diagnostics tests. They were considered as a binary event (referred vs non-referred). To estimate the relative risks (RR) of having a follow-up visit in the PHC clinic after the referral, only patients who had been referred to the specific specialty under analysis were considered. Follow-up visits were also considered binary events categorised as the patient having or not having one medical consultation (1) 90 days after the referral or (2) 180 days after the referral. The 32 most commonly requested medical specialties consultations and diagnostics tests in our dataset were used to perform this analysis.

Comparing both the risk of a patient being referred to SC and the risk of having a follow-up visit by doctors with different types of training can bring us evidence about the effect that RTFM has on promoting both a more effective healthcare for the patient in primary care and a better continuity of care and coordination between primary and secondary levels of care. This notion is aligned with the definition of FM from the Brazilian,[31] Canadian[34] and European[35] curricula for FM, that is, that experts in FM 'are skilled clinicians that are capable of managing a full range of health conditions', 'make efficient use of healthcare resources through coordinating care' and 'are responsible for the provision of longitudinal continuity of care as determined by the needs of the patient.'

Statistical analyses

Multilevel multivariate binomial regression models were used to estimate the RRs of patients being referred to SC in one medical consultation and patients having a follow-up visit in 3 and 6 months after being referred to SC, according to the medical category of the doctor in charge. A hierarchical data structure was created with consultations from the same patient clustered and ordered per each individual patient, taking into account the correlation among consultations from the same patient.

Each outcome was analysed individually. Mammography, gynaecology and gynaecological surgery entailed just women and high-risk prenatal care (HRPC) entailed only pregnant women. Models were adjusted for first level covariates (consultation), that is, patient's age, patient's CCI, prenatal care consultation, time and medical category; and for second level covariates—SDI and patient's sex.

Variance partition coefficients (VPCs) were calculated for all adjusted models in order to explore the proportion of the variance attributed to the second level, that is, the variance attributed to patients characteristics.[36]

PAF for each requested service was calculated using the RR from the multivariate regression models to estimate the impact in the number of referrals requested per year in the same healthcare district if all medical consultations were performed by trained FPs.[37 38] Data processing and statistical analysis were performed using R V.3.6.2 and lme4 package.

RESULTS

A similar proportion of women (2/3) and men (1/3) with a small difference for age and SDI distributions was seen by FPs and generalists. Each subgroup had patients from the most affluent (SDI=0.689) and the least affluent areas (SDI=0.416). Although doctors in the sample had not necessarily worked throughout the entire study period, the proportion in the sample represents the distribution of the categories among 30 clinics and 196 FHT (table 1).

Ambulatory care services were less likely to be requested by FPs, except for ophthalmology, physiotherapy and rehabilitation, which were requested more frequently by FPs (table 2). Surgical specialties tended to be requested less often by FPs to ambulatory care in ENT, orthopaedics, general surgery, gynaecology, vascular surgery and urology. When the referral was related to surgical evaluation in plastic surgery, orthopaedic surgery or eye surgery, FPs tended to refer their patients more frequently.

Diagnostic tests, such as colonoscopy, echocardiogram, EGD and CPX tests were less frequently requested by FPs. Spirometry and mammography were the only exceptions.

Patients referred to SC by FPs were more likely to have follow-up visits in primary care after 3 and 6 months than

Table 1 Number of medical consultations and patients' characteristics according to each medical category in the study sample

Medical category	No of doctors—N (%)	Consultations—N (%)	Referrals per 100 consultations	SDI—mean (SD)	Patients' age (%)			Patients according to sex—N (%)	
					<18	>18 and <45	>45	Women	Men
Generalists	633 (75.6)	1 629 235 (67.5)	12.7	0.573 (0.03)	21.3	31.8	46.9	1 067 212 (65.6)	562 023 (34.4)
Family physicians	204 (24.4)	785 273 (32.5)	9.9	0.585 (0.03)	18.5	34.5	47.0	517 813 (65.9)	267 460 (34.1)

Rio de Janeiro, Brazil, 2015–2018.

those referred by generalists for almost every service requested. HRPC was the only ambulatory care service that FPs and generalists presented similar risk of a patient having a follow-up visit in the 3 and 6 months period (table 3).

In a hypothetical scenario where all medical consultations were performed by FPs, all medical specialties would experience a decrease in demand for ambulatory care, with Angiology being, in relative terms, the most affected—PAF 55.6% (95% CI 51.3% to 58.9%)—and dermatology and orthopaedics having the biggest absolute reduction, with 1532 (95% CI 1458 to 1602) and 1696 (95% CI 1612 to 1780) fewer requests every year. Contrarily, replacing generalists by FPs would increase by 37.6% (95% CI 32.4% to 42.4%) the demand for rehabilitation services and by 13.3% (95% CI 10.9% to 16.2%) the demand for eye surgery (table 2). Surgical specialties such as plastic surgery and orthopaedic surgery would have an increase in demand for consultations, while ENT and general surgery would have a decrease in demand. For these two surgical specialties there would be 439 (95% CI 374 to 506) and 111 (95% CI 48 to 174) fewer requests every year, respectively.

At the same time, the demand for most of the diagnostics tests would decrease, and 403 (95% CI 365 to 441) fewer EGD tests and 277 (95% CI 232 to 315) fewer echocardiograms would be requested every year.

Although the inclusion of the age, sex, SDI, time and the CCI in the models slightly changed the effect sizes and CIs of the main exposure, these variables were kept in the models that provided the RRs and PAFs reported here. Variance inflation factors were always below 3 in all models.

The VPC showed that the proportion of variance attributed to the second level (patient characteristics) is more important for the occurrence of a referral than for the occurrence of a follow-up visit, with a consistent pattern for all types of services studied. The proportion of the variance attributed to the patient level for pulmonology, endocrinology and spirometry, for example, are up to 53%, 40% and 43%. At the same time, looking at follow-up visits for those patients referred to these three services, no more than 0.05%, 0.03% and 0.01% of the variance can be attributed to differences between patients.

DISCUSSION

This research has taken a non-judgemental approach to the doctor–patient clinical encounter. It considers that every doctor in this sample has made the best possible decisions to provide the most appropriate healthcare to their patients and the comparisons between FPs and generalists aim solely to analyse the patterns behind the numbers that represent the impact of having two extra years of training to work in primary care.

Our study findings highlight a significant distinction in the types of consultation services that are more or less likely to be requested by FPs. When FPs were in charge of the consultation, the number of referrals in half of the ambulatory care specialties decreased by more than 50%. Services that did not require equipment or special skills other than clinical reasoning or general medical skills also had a significantly lower risk. On the other hand, ophthalmology, physiotherapy and rehabilitation — ambulatory care services that make use of special equipment and demand specific skills to be performed—were more often requested by FPs (table 2).

Both physiotherapy (reserved for minor musculoskeletal injuries) and rehabilitation (motor, neurological, intellectual and respiratory rehabilitation, as well as orthosis confection, prosthesis and stoma care) are services that require specific biomedical technology and skilled professionals to be performed. These are usually available at the secondary level of the healthcare system. At the same time, ophthalmology, plastic surgery (exclusively reconstructive procedures) and eye surgery followed the same pattern, and patients were more frequently referred by FPs.

Part of the lower risk for requesting a referral to ambulatory care services among FPs can be explained by the learning opportunities that residents have during the 2 years of training. As part of the learning activities,[22] residents have case discussions with dermatologists and psychiatrists every other week at the clinic. They can book the patients they are facing difficulties to have a joint consultation with a specialist, sharing decisions about diagnostics and management, and discussing the resident's educational needs, based on that case.[39] Biopsies and small procedures are mostly performed at the clinic as well. Due to its high prevalence, residents

Table 2 Relative risks of patients being referred to SC in one medical consultation in PHC according to the medical category of the doctor in charge—generalists (reference) and family physicians

Medical specialty	Family physicians	Average no of referrals per year	Population attributable fraction % (95% CI)	Change (and 95% CI) in the no of referrals per year if all doctors were family physicians
Ambulatory care				
Cardiology	0.4 (0.38 to 0.43)	2008	−50.3 (−47.2 to −52.4)	−1010 (−948 to −1052)
Neurology	0.5 (0.47 to 0.53)	1835	−40.3 (−37.4 to −43.2)	−740 (−686 to −793)
Psychiatry	0.45 (0.4 to 0.5)	897	−45.2 (−40.3 to −50.3)	−405 (−361 to −451)
Dermatology	0.49 (0.47 to 0.51)	4144	−41.3 (−39.3 to −43.2)	−1711 (−1629 to −1790)
Pulmonology	0.54 (0.48 to 0.6)	903	−36.5 (−31 to −42.2)	−330 (−280 to −381)
Infectious diseases	0.74 (0.63 to 0.87)	290	−19.2 (−9.2 to −28.4)	−56 (−27 to −82)
Urology	0.57 (0.54 to 0.61)	1762	−33.7 (−30.1 to −36.5)	−594 (−530 to −643)
Allergology	0.54 (0.47 to 0.6)	480	−36.5 (−31 to −43.2)	−175 (−149 to −207)
Nephrology	0.63 (0.57 to 0.7)	603	−28.4 (−22.4 to −33.7)	−171 (−135 to −203)
Endocrinology	0.42 (0.38 to 0.46)	1021	−48.2 (−44.2 to −52.4)	−492 (−451 to −535)
Gastroenterology	0.38 (0.34 to 0.42)	867	−52.4 (−48.2 to −56.7)	−454 (−418 to −492)
Angiology	0.35 (0.32 to 0.39)	1030	−55.6 (−51.3 to −58.9)	−573 (−528 to −607)
Rheumatology	0.47 (0.42 to 0.52)	830	−43.2 (−38.4 to −48.2)	−359 (−319 to −400)
Physiotherapy	1.17 (1.11 to 1.23)	2390	10.9 (7.2 to 14.4)	261 (172 to 344)
Rehabilitation	1.68 (1.57 to 1.79)	1173	37.6 (32.4 to 42.4)	441 (380 to 497)
Ophthalmology	1.09 (1.06 to 1.12)	8713	5.9 (4 to 7.8)	514 (349 to 680)
ENT	0.71 (0.67 to 0.75)	2269	−21.6 (−18.4 to −24.9)	−490 (−417 to −565)
Orthopaedics	0.52 (0.5 to 0.54)	4934	−38.4 (−36.5 to −40.3)	−1895 (−1801 to −1988)
Gynaecology	0.86 (0.79 to 0.94)	738	−9.9 (−4.1 to −15.2)	−73 (−30 to −112)
HRPC	0.66 (0.6 to 0.72)	991	−25.8 (−20.8 to −31)	−256 (−206 to −307)
Surgical evaluation				
Eye surgery	1.21 (1.17 to 1.26)	4458	13.3 (10.9 to 16.2)	593 (486 to 722)
Gynaecological surgery	0.87 (0.81 to 0.95)	989	−9.2 (−3.4 to −13.7)	−91 (−34 to −135)
Orthopaedic surgery	1.22 (1.02 to 1.47)	147	13.9 (1.3 to 27.5)	20 (2 to 40)
General surgery	0.91 (0.86 to 0.96)	1968	−6.3 (−2.7 to −9.9)	−124 (−53 to −195)
Plastic surgery	1.19 (1.1 to 1.29)	859	12.1 (6.5 to 17.9)	104 (56 to 154)
Vascular surgery	0.87 (0.77 to 0.99)	359	−9.2 (−0.7 to −16.8)	−33 (−3 to −60)
Diagnostic tests				
Echocardiogram	0.66 (0.62 to 0.71)	1201	−25.8 (−21.6 to −29.3)	−310 (−259 to −352)
Spirometry*	0.96 (0.85 to 1.09)	385	−2.7 (−10.6 to 5.9)	−10 (−41 to 23)
Colonoscopy	0.76 (0.68 to 0.85)	510	−17.6 (−10.6 to −24.1)	−90 (−54 to −123)
EGD	0.49 (0.45 to 0.53)	1090	−41.3 (−37.4 to −45.2)	−450 (−408 to −493)
CPX test	0.72 (0.64 to 0.81)	431	−20.8 (−13.7 to −27.5)	−90 (−59 to −119)
Mammography*	0.98 (0.93 to 1.03)	2424	−1.4 (−4.8 to 2)	−34 (−116 to 48)

All models had a p value lower than 0.001, except those marked as *.

All models were adjusted for first level covariates (consultation), that is, patient's age, patient's Charlson Comorbidity Index, prenatal care consultation, time and medical category; and for second level covariates—SDI and patient's sex. Gynaecology, gyneacological surgery and mammography considered only women as population at risk.
Rio de Janeiro, Brazil, 2015–2018.
*Non-statistically significant in the multivariate binomial models.
EGD, Esophagogastroduodenoscopy; ENT, ears, nose and throat; HRPC, high-risk prenatal care; PHC, primary healthcare; SC, secondary care; SDI, Social Development Index.

Table 3 Relative risks of patients having a follow-up visit in PHC within 3 and 6 months after being referred to secondary care by generalists (reference) or family physicians

Medical specialty	3 months	6 months
Ambulatory care		
Cardiology	1.86 (1.62; 2.14)	1.74 (1.48; 2.04)
Neurology	1.78 (1.56; 2.03)	1.74 (1.49; 2.02)
Psychiatry	2.15 (1.75; 2.64)	2.05 (1.62; 2.61)
Dermatology	1.42 (1.30; 1.55)	1.45 (1.32; 1.60)
Pulmonology	1.73 (1.41; 2.11)	1.76 (1.39; 2.23)
Infectious diseases	2.02 (1.47; 2.77)	1.55 (1.11; 2.17)
Urology	1.74 (1.54; 1.98)	1.79 (1.55; 2.06)
Allergology	1.89 (1.47; 2.41)	1.97 (1.50; 2.58)
Nephrology	2.17 (1.74; 2.71)	1.89 (1.45; 2.46)
Endocrinology	1.74 (1.44; 2.11)	1.47 (1.19; 1.82)
Gastroenterology	1.77 (1.42; 2.20)	1.92 (1.48; 2.50)
Angiology	1.40 (1.15; 1.70)	1.40 (1.12; 1.75)
Rheumatology	1.86 (1.52; 2.28)	1.58 (1.25; 1.98)
Physiotherapy	1.73 (1.58; 1.90)	1.72 (1.54; 1.92)
Rehabilitation	1.73 (1.52; 1.97)	1.55 (1.34; 1.80)
Ophthalmology	1.62 (1.54; 1.70)	1.57 (1.49; 1.66)
ENT	1.70 (1.53; 1.89)	1.52 (1.36; 1.71)
Orthopaedics	1.83 (1.69; 1.97)	1.63 (1.50; 1.78)
Gynaecology	1.88 (1.57; 2.25)	1.78 (1.45; 2.18)
HRPC*	1.16 (0.93; 1.44)	0.92 (0.71; 1.19)
Surgical evaluation		
Eye surgery	1.62 (1.51; 1.74)	1.45 (1.34; 1.58)
Gynaecological surgery	1.65 (1.42; 1.93)	1.55 (1.30; 1.84)
Orthopaedic surgery*	1.48 (1.01; 2.16)	1.22 (0.81; 1.82)
General surgery	1.74 (1.56; 1.93)	1.64 (1.45; 1.84)
Plastic surgery	1.51 (1.30; 1.77)	1.43 (1.21; 1.68)
Vascular surgery*	1.24 (0.96; 1.60)	1.51 (1.14; 2.01)
Diagnostic tests		
Echocardiogram	1.91 (1.64; 2.23)	1.53 (1.28; 1.84)
Spirometry	1.48 (1.15; 1.90)	1.65 (1.22; 2.23)
Colonoscopy	1.72 (1.38; 2.15)	1.43 (1.12; 1.85)
EGD	2.04 (1.71; 2.43)	2.17 (1.75; 2.68)
CPX test	2.02 (1.58; 2.58)	1.70 (1.27; 2.28)
Mammography	2.03 (1.84; 2.24)	1.93 (1.72; 2.17)

All models had a p value lower than 0.001, except those marked as *.
All models were adjusted for first level covariates (consultation), that is, patient's age, patient's Charlson Comorbidity Index, prenatal care consultation, time and medical category; and for second level covariates—SDI and patient's sex. Gynaecology, gynaecological surgery and mammography considered only women as population at risk.
Rio de Janeiro, Brazil, 2015–2018.
*Non-statistically significant in the multivariate binomial models.
ENT, ears, nose and throat; HRPC, high-risk prenatal care; PHC, primary healthcare; SDI, Social Development Index.

are trained in chronic pain management to deal with myofascial pain, to perform dry needling to relief trigger points, and simple physiotherapy exercises that can be performed by the patient alone or with the supervision of the physical educator at the local community gym available in every primary care clinic. Without the supervision of those specialists and the focused training in chronic pain management, FP would probably request referrals to dermatology, psychiatryand physiotherapy more frequently.

However, the vast majority of the patients, including cases involving skin lesions and mental health issues, are regularly managed by the FHT with the help of a preceptor in FM. Cases that could also have been referred to a general surgeon, such as lipomas, sebaceous cysts and skin biopsies, or vascular surgery, such as chronic venous insufficiency, are included in the residents' training, making them more competent to manage these conditions in PHC. On the other hand, plastic surgery (exclusively reconstructive procedures) is another specialty that needs trained professionals to be performed and FPs are more likely to request it.

Learning how to manage the most prevalent health conditions in PHC during RTFM can increase both the awareness about the conditions and the built-in capacity to manage them. The former makes FPs more prepared to recognise and diagnose the condition; the latter provides the necessary tools to treat it. This can explain why FPs are less inclined to request diagnostic tests for their patients. Diagnostic tests are part of the clinical reasoning process and if residents learn how to use them with an evidence-based approach, it is more likely that they will more cautiously select the patients that need them. This is not a new concern in PHC[40] and is aligned with the Choosing Wisely[41] and the Quaternary Prevention[42] initiatives, that exert a strong influence in the FM community by calling the attention of doctors and patients to the potential harms that unnecessary tests, treatments and procedures can make. This requires a balanced approach to healthcare that takes into account issues around the underuse and the overuse of tests and/or treatments. Our study shows the distinction between services that patients are less likely from those they are more likely to be referred by FPs. This gives us a clue about what has been requested too much (cardiology, endocrinology, allergology) and what has been requested too little (eye surgery, orthopaedic surgery, physiotherapy) in the public PHC system in Rio de Janeiro.

In regard to follow-up visits being consistently more likely to happen among FPs, one could argue that the turnover and the shortage of doctors—two common issues in the Brazilian PHC—could have influenced the occurrence of this event. We cannot assure that retention in the same FHT was the same for every category. But if FPs were more inclined to stay working in the same FHT, we would not see a similar likelihood of follow-ups for women referred to HRPC—RR 1.16; 95% CI 0.93 to 1.44 in 3 months and RR 0.92; 95% CI 0.71 to 1.19 in

6 months. Pregnant women have regular medical visits in PHC every month in the first semester, every 2 weeks in the last trimester, and every week in the last month. Of the 3547 women referred to that service (885 by FPs and 2662 by generalists), similar proportions had a follow-up visit within 3 (85.6% by FPS vs 83.6% by generalists) and 6 months (89.5% by FPs vs 90.2% by generalists). Comparing to Cardiology, where FPs were more likely to follow-up their patients in 3 months (RR 1.86; 95% CI 1.62 to 2.14) and in 6 months (RR 1.74; 95% CI 1.48 to 2.04), only 53.9% and 71.3% of those referred by generalists had a follow-up visit in 3 and 6 months, while FPs have followed up 68.3% and 81.3% of their referred patients, respectively.

Table 2 highlights in absolute numbers how much change this intervention can make. Some results show a big difference in terms of distribution and provision of specialised care since some of the services would have their demand decreased by more than 50%. The investments made by the RJ-MHD to promote RTFM have already achieved some results, and its impact could be extended to the whole population if a feasible and sustainable expansion plan is put in place. This expansion should account for several variables that were not explored in this study and may rely not only on political will but on individual aspirations and preferences as well.

The VPCs show us that the proportion of the variance attributed to the patient has major importance in the risk of a referral to SC being requested, but little influence on the occurrence of a follow-up visit. Although patients' information has a major influence on the variance, FPs (a first level variable) reduce significantly the risk of a patient being referred. The little influence that patients' information has on the occurrence of a follow-up visit demands additional studies exploring other aspects affecting it. If aspects related to the physician in charge (FP or generalist) can better explain part of the variance, it would provide another piece of evidence that RTFM improves coordination and, in this case, continuity of care.

Finally, the impact of RTFM cannot be summarised exclusively in terms of referrals to SC. Residents in FM are not trained to perform one task, but to take care of people from cradle to grave.[43] During 2 years of RTFM they develop clinical, relational, scholar and managerial competencies to provide the best patient-centred care in a community.[31 44 45] They are not trained exclusively to decide if a patient should or should not be referred to SC. This is just a detail of a much larger learning process whose effect goes beyond the RR measured in this study. That being said, it is reasonable to believe that RTFM must have an impact that goes beyond changing patterns of referrals to SC, affecting positively the quality of care delivered, and outcomes related to patients' morbidity and mortality. Without a doubt, further research must be performed testing this hypothesis.

Strengths and limitations

Evaluating PHC is a hard task and we tried to do it by aiming two specific aspects of PHC—professional training and referrals to SC. The first is a complex intervention and the second a surrogate outcome. Endpoint outcomes, such as hospital admissions, quality of life, quality of care, patients' satisfaction, survival and absenteeism in the referral consultations should be studied in the future to draw a clearer dimension of the impact measured in this study. As mentioned before, having the full information about doctors' individual and educational characteristics would have helped to better measure the role that training FM plays in the attributes of PHC.

Apart from these limitations, empirical evidence about a real experience from a middle-income country can be better translated to similar countries that face the same difficulties to develop their PHC systems.[46] This kind of evidence can help to promote the development of FM in countries where PHC is still very incipient,[47] and FM is often not recognised as a medical specialty.[48 49]

CONCLUSION

Training doctors to develop the competencies needed to manage a broad scope of health conditions in PHC is one of the main goals of residency programmes in FM. As a public health intervention, RTFM changes the pattern of referrals commonly seen in PHC when only generalists take care of the population. In summary, it makes FPs more competent to retain those health conditions that can be properly managed in primary care and, at the same time, makes them more capable of detecting health issues that require specific biomedical technologies and skills, increasing the demand for those services. Besides, it increases the chances of a patient having a follow-up visit, improving coordination and continuity of care of their FHT. This is a real change not only in terms of comprehensiveness and coordination of care but also in costs paid by health systems, families and society. Policymakers should look closely at the findings described in this article and consider carefully that investments in RTFM can make their PHC systems more comprehensive, with better coordination and continuity of care.

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AGJ and APdL performed the multilevel analysis. AGJ, BB, GHN and APdL discussed the results from the multilevel analysis and decided together what relevant information should be reported in the manuscript. BB, GHN and APdL reviewed and made comments on the manuscript. AGJ, BB, GHN and APdL wrote and have agreed to submit the final version of the manuscript.

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