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New professional roles and patient satisfaction: evidence from a European survey along three clinical pathways

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Highlights

- We explore the impact of new professional roles on patients satisfaction.
- Data were collected in a cross sectional self completed questionnaire study.
- We investigated monitoring and educational practices being performed along three clinical pathways.
- We found minimal effects when care was provided by non-medical staff.
- For respondents with breast cancer, care from nurses resulted in increased satisfaction.

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Abstract: This paper reports the results of an empirical analysis exploring the impact of new professions (eg a physician associate) and new professional roles on patient experiences of and satisfaction with care. A sub set of data from a patient survey conducted as part of the MUNROS programme of work was used. The overall survey aim was to describe and quantify the use of new professionals and new roles for established health care professionals other than medical doctors, in primary and secondary care sectors in three care pathways in nine European countries Ordered logit models were used to investigate the association between: (1) patient satisfaction with the last visit; (2) with their care provider; (3) with the information provided and a set of covariates explaining the involvement of new professional roles in three clinical pathways: type 2 diabetes, heart disease and breast cancer.For patients with breast cancer, high levels of satisfaction are associated with the involvement of new professions/professional roles in the provision of conditions specific education and monitoring. For patients with heart disease, the involvement of new professions/professional roles is likely to have a negative impact on satisfaction. For patients with Type 2 diabetes results are ambivalent. .Patients belonging to countries experiencing innovative models of healthcare delivery and with high levels of involvement of new professions/professional roles are generally more satisfied. In

conclusion, the introduction of new professions does not affect patient satisfaction negatively, therefore introducing new health professional roles is a pursuable strategy from a patient satisfaction perspective, at least for breast cancer and type 2 diabetes.

Keywords: Healthcare delivery models; Patients' satisfaction; New professional roles, european survey, monitoring and education provision JEL: I12, I18, J21

Introduction

Expenditure on health care is the second largest single item of public spending in all the EU states [1] putting intense pressure on public finances. Member states have in place plans to reduce the rate of growth if not the absolute level of public expenditure. However these constraints come at a time when population need for health care is growing rapidly as a result of changing demography and changing paradigms for treatment. Managing these competing issues is a major challenge both in terms of organizational capacity of healthcare services to respond promptly to the

increased need and in terms of economic sustainability. In most EU countries, the highest share of national healthcare expenditure (approximately 65%) concerns labor costs. In a traditional physician–centered models of healthcare delivery, medical doctors are the healthcare professionals whose involvement is associated with the highest opportunity cost. In response, EU countries are designing and implementing policies aimed at changing the size and composition of the health care workforce by introducing new, and (or) extending traditional, roles for non-medical health care professionals. The intention is to deliver cost containment without negatively affecting the quality and appropriateness of care.

New professional roles can either result in delegation of care from doctors to other healthcare professionals (in which case the doctor may still retain a supervisory role and remain responsible for the overall care of the patient) or substitution (in which a professional, such as a nurse prescriber, assumes full responsibility for a task -prescribing - previously the preserve of a doctor). Both of these have further ramifications as care previously delivered by, for example, a nurse is now delivered by a healthcare assistant [2]. These innovations have variously been reported as fragmenting care and increasing overall costs [3,4], as well as improving the quality of care, both in terms of improved outcomes and other performance indicators such as shorter waiting times [5-8]. Patients and professionals judge the quality of care from different perspectives, and as such patient satisfaction can also be used as an indicator of the perceived quality of care [9]. Patient satisfaction strongly depends on their perceived improvement in quality of life (e.g. relief of symptoms) and therefore on the effectiveness, safety and appropriateness of treatments. The perception that patients have of the quality of care received is also associated with the attitude of the workforce such as the personal traits of doctors (e.g. friendliness, courtesy, respect), the general services received (e.g. cleaning and the quality of food [10], time spent with patients [11], visit related factors (e.g. number of visits, length of visit), and the way health information is communicated [12, 13]. Barriers that decrease the perceived quality of care, and therefore patient satisfaction include poor communication and preference for a particular gender of health care provider [14]. However, making decisions, at policy or individual provider level, on the basis solely of patient satisfaction, could lead to negative effects on the overall costs of care, and other quality indicators such as waiting times, over prescribing and unnecessary referrals. Therefore a balance has to be sought between maximizing patient satisfaction and providing cost effective and clinically effective care.

One solution is to assess the potential of new organizational models which include new professions and new professional roles [3, 7, 15, 16]. However whilst this approach is increasingly

widespread, little is known about the overall effects of this approach on the outcomes and costs of care, including patient satisfaction.

The work reported in this paper is a based on an analysis of a subset of data from the MUNROS programme of work (The iMpact on practice, oUtcomes and costs of New roles for health pROfeSsionals) [17] the overall aim of which was to inform a multidisciplinary workforce planning model based on the competencies needed to deliver care rather than on a professional basis (e.g. the number of doctors and nurses needed). The programme of research systematically studied the care provided, and the provider of that care, along the three clinical pathways of breast cancer, coronary heart disease and type 2 diabetes in nine European countries: Czech Republic, England, Germany, Italy, The Netherlands, Norway, Poland, Scotland, and Turkey. In this paper we report the results of an empirical analysis aimed to investigate the impact of new professions and new professional roles on patient satisfaction, as a proxy for perceived quality of care.

Method

Study design

This was a cross-sectional patient self-completed survey The method followed the published protocol [17] and was approved by relevant Ethical authorities of each participating country.

Countries

Nine countries were selected purposively to reflect differences in health care systems in order to maximize the probability of observing the change induced by the introduction of new professional roles compared with the traditional ones. The countries included those in a later stage of the transition process from highly centralized (ex-communist) systems (Czech Republic and Poland) to those at the forefront of innovation (Netherlands, Scotland and England along with countries characterized by more established and stable systems (Germany, Italy and Norway), and Turkey, a country in the process of reforming the health system.

Clinical condition

Three conditions (breast cancer, heart disease and type 2 diabetes) were selected representing respectively a condition involving elective surgery with predominantly secondary care based follow-up, a condition presenting acutely in secondary care followed by long-term follow-up in primary care and a condition largely managed in primary care. The iterative process for selecting

these three conditions has been previously described [17].

Clinical setting

All hospitals in each country were listed, and stratified by type (university and general hospitals), and depending on numbers by geographical region, rurality (urban, suburban or rural), and deprivation level. Specialist hospitals (e.g. mental health hospitals) and community hospitals (staffed by family physicians only) were excluded. Eligible hospitals were invited to take part in the survey by mailing an invitation pack (covering letter, participant information sheet, and expression of interest form). Primary care centers associated with the final sample of recruited hospitals were identified and invited following a similar procedure. Seven countries collected data for all three conditions (Czech Republic, England, Italy, Norway, Poland, Scotland, Turkey) and two (Germany and the Netherlands) collected data for breast cancer and heart disease only.

Participants and eligibility

The participants were patients attending the relevant clinic at the recruited hospital, or the associated primary care setting who met the following inclusion and exclusion criteria:

1. Male or female aged 21 years and over;
2. Receiving care for breast cancer, heart disease or type 2 diabetes.
3. Able to understand the purpose of the study and to complete the questionnaire.

In addition, the following disease specific inclusion criteria were applied:

- Breast cancer: patients are between three months to two years' post-surgery;
- Heart disease: patients have had a ST segment elevation myocardial infarction (STEMI) , are stabilized (i.e. may still be during initial hospital admission) or within the first two years of follow-up;
- Type 2 diabetes: patients are between three months to two years of follow-up since diagnosis

Identification and recruitment of patient participants

A key contact person was identified at each clinical site. According to [17] for each care pathway, patients meeting the inclusion criteria were identified either prospectively, as they attended clinical appointments or from clinical lists, according to local preferences. Those belonging to the former group were provided with an invitation pack (covering letter, patient information leaflet, and questionnaire) by the responsible clinician. They were asked to complete and return the questionnaires directly to the researchers via a special mailbox in the clinic or by mailing it directly

in a reply-paid envelope. Those identified from clinic lists were mailed the invitation pack by the clinical staff or their designated representative. A log of patients was maintained to allow identification of non-responders and targeted reminders to be sent. Only in Turkey, patients attending the clinics were asked to complete the questionnaires while waiting for their appointment.

The questionnaire

The questionnaire development and piloting has been previously described. The final questionnaire included six sections as follows:

Section 1 General health: confirmation of diagnosis, Charlson Index (a list of comorbidities used to create a validated score [18]), EuroQol 5D-5L items and thermometer (visual analogue scale).

Section 2 Care received: completion of a matrix with different aspects of care ('Information, education or advice', and 'Monitoring or other treatment') organised as columns and the health care professional providing that care as rows. Completion was by tick box (yes/no options).

Section 3 Experience of care: a list of 20 items associated with ideal patient centered care with completion on a five point (Likert scale ranging from 'almost always' to 'almost never' and with a 'not relevant' option); perceptions about the changes in the type of professional (doctor or non-doctor) providing their care, the perceived organization of the care received (a single doctor responsible/care well-coordinated between multiple providers) and their satisfaction with care (Likert scale responses to six parameters of care (including he care provider and the information provided, and a seventh for overall satisfaction with their last visit; seven points ranging from 'extremely dissatisfied' to 'extremely satisfied' and with a 'not applicable' option).

Section 4 Use of health care services: professional seen when receiving care in the last three months and in each health care setting (inpatient/outpatient/primary care - tick box and open questions), medications and procedures received, social care (professional/lay) received.

Section 5 Willingness-to-pay for an ideal visit: patients were asked to indicate a value.

Section 6 Demographic characteristics: weight, education, employment, income, lifestyle and the effect of the disease on their productivity.

Sections 4 and 5 above are summarized here for completeness but the responses are not included in the analyses reported in this paper.

Sample size

There was a target to recruit 12 hospitals in each country and in each hospital for clinics relevant to all three conditions to participate (other than Germany and the Netherlands who were only to studying breast cancer and type 2 diabetes). Thus there were planned to be a total of 300 collection

sites (36×7 plus 24 X 2). An average of 5 primary care centers per hospital was assumed, i.e. 540 (60×9). In each hospital data collection site there was a target of 30 eligible patients, and in each primary care site six patients with each condition (i.e. a total of 18000 (9000+(60 x 18 x 7) + (60 x 12 x2)) to be sent a survey). A response rate of 50% was assumed.

Data management and analysis

Data was entered at country level by local researchers into an agreed Excel template, with a 10% double data entry for quality assurance, before exporting to STATA for cleaning and merging into a single dataset. Simple descriptive frequencies were conducted followed by ordered logit models to investigate the association of patient satisfaction with covariates explaining the involvement of new professions/new professional roles in each pathway. As the dependent variables of interest related to satisfaction are ordinal a linear regression model would have not been inappropriate. Tasks examined along the care pathway in detail were grouped to: (a) provision of educational support (information as leaflets or weblinks; signposting to education programs; advice on healthy eating and exercise; advice on smoking cessation, advice on medicines) and (b) pathway-specific monitoring: breast cancer (emotional support, regular checkups, and an open other option); heart disease (blood pressure, blood tests, heart tests, weight checks emotional support) and type 2 diabetes (blood pressure, blood sugar, blood lipids, emotional support, foot checks). For each group of tasks (educational support and monitoring activities) we created four dummy variables in order to model whether tasks were performed by: (1) Physician Assistants; (2) Nursing Staff; (3) Pharmacists; (4) Allied Professionals or (5) Medical Staff (GP or specialists) which was considered our comparison group. Comorbidities (Charlson Index), socio-economic and demographic variables and a set of country variables were all controlled for.

Because of the high heterogeneity in the frequencies of patients belonging to each country enrolled in the study (see Table 1), we created two dummy variables discriminating for patients belonging to (1) countries with innovative service models involving the wider health care team (England, Scotland and The Netherlands); (2) countries with a traditional physician-centered model (Germany, Italy and Norway) and (3) countries with high level of centralization (Czech republic, Poland and Turkey) which was considered our comparison group. High heterogeneity was also found concerning education levels.. This would have caused problems with the residuals estimations in the regression framework. For this reason education levels were included in the model by mean of a dummy variable representing whether patients were holding a bachelor degree or not. For each pathway, three models were estimated with the dependent variables being discrete

variables which were derived by recoding the seven Likert levels into three as follows: (1) 1-3 - dissatisfied; (2) 4-5 - moderately satisfied; and (3) 6-7 - very satisfied. The dependent variables expressed levels of satisfaction with (a) the overall satisfaction with last visit; (b) satisfaction with care provider and (c) satisfaction with information provided. The formal specification was:

(2)

$$SATn_P = \alpha + \beta_1 EDUPHAS + \beta_2 EDUNS + \beta_3 EDUPHAR + \beta_4 EDUALP + \beta_6 MONIPHAS + \beta_7 MONINS + \beta_8 MONIPHAR + \beta_9 MONIALP + \beta_{10} FEMALE + \beta_{11} BACHELOR + \beta_{12} EMPLOYED + \beta_{13} AGE + \beta_{14} AGESQ + \beta_{15} CIC + \beta_{16} COUNTRY1 + \beta_{17} COUNTRY2 + \varepsilon$$

Table 1 shows the description of subscripts, variables and coefficients. Significance levels were set *a priori* at 1% with 5% associations also noted.

TABLE 1 [insert here}

Sensitivity analyses and regression diagnostics

Firstly we computed the correlation matrix to detect multicollinearity. Secondly, we used a link test to investigate the correct specification of our model. For every estimation across the three pathway-specific models, we tested (1) the linear specification (null hypothesis) versus a quadratic form (alternative hypothesis) and (2) whether any potentially relevant variable had been omitted. Thirdly, restricted forms of the models were estimated to test for the models' stability when excluding any groups of covariates from the estimation. Groups of covariates excluded were those explaining whether: (a) educational support is provided (in equation (2) from *EDUPHAS* to *EDUALP*); (b) monitoring support is provided (in equation (2) from *MONIPHAS* to *MONIALP*). Fourthly, interaction forms were studied. We explored some alternative specifications where two discrete variables were created in order to explain whether patients were provided with educational support or monitoring by more than one professional. The discrete variables had values of 1, 2 or 3 according to whether patients were receiving educational support or monitoring by one, two or three different professionals respectively.

Results

Descriptive findings

The response rate to the surveys was 32.3% for breast cancer (1047/3240), 35% for heart disease (1136/3240) and 30.7% for type 2 diabetes (775/2520). The general characteristics of the sample (age, gender, education etc) along with the number of patients enrolled, are shown in the Appendix Table A1 for each country and all three conditions explored.

Information, education or advice received by patients

Whilst most patients with type 2 diabetes reported receiving education, information or advice from a medical staff during their care (ranging from 96.5% (279/289) for Italy to 64.00% (48/75) for England) there was less consistency for heart disease (ranging from 81.97% (50/61) for the Netherlands to 28.23% (35/124) for Turkey) or breast cancer (ranging from 86.11% (62/72) for the Czech Republic to 21.91% (39/178) for Turkey). General leaflets were dominant forms of education across all three conditions with advice on lifestyle and medicines being frequently reported for breast cancer. For patients with heart disease referral to other programs and smoking cessation advice were also frequently mentioned, as was the case for patients with type 2 diabetes (although smoking advice was not reported by many of the responders from England and Scotland). No particular type of education was provided solely by a single type of health care professional in any country, although medical staff and nursing staff were reported by patients most frequently. This was especially the case for patients with breast cancer compared to the other two conditions in which pharmacists and AHPs were more involved especially in Scotland and the Netherlands for heart disease and Scotland Italy and Norway for patients with type 2 diabetes.

Monitoring or other treatment received

The proportion of patients who stated they had received some kind of monitoring ranged between 100% to 66% for respondents with breast cancer, 97% to 58% in the heart disease sample, and 95% to 64 in the type 2 diabetes sample. Concerning patients suffering from breast cancer, the type of monitoring or treatment varied by country; for example whilst emotional support was widely reported to have been provided in all countries this was less in Norway and Italy. Regular checks were universally provided, with medical staff generally involved. In England physician associates were involved in 'other' checks or treatments, and AHPs consistently contributed to a small extent.

Most respondents with heart disease reported receiving blood pressure checks, and blood and heart tests from both medical and nursing staff. Emotional support was less universally reported especially from respondents in Norway. Most monitoring appeared to be conducted in Italy, Scotland and England and least in Norway.

In all countries respondents suffering from T2D reported receiving monitoring principally from the

medical and the nursing staff with pharmacists and allied professionals playing a smaller role than for the other two conditions. Blood pressure checks, blood sugar and lipids were monitored more than mental health or podiatry checks. The Czech Republic, Norway and Turkey were more doctor-centered and in Italy allied health professionals paid particular attention to foot checks. Poland, England, Norway and the Czech Republic reported less monitoring than the other countries.

Inferential results

Breast Cancer

Table 2 below shows the results for respondents with breast cancer. Compared to care provided by medical staff, there is a positive co-efficient i.e. a positive relationship, between satisfaction with all three included aspects of care, and the delivery of an educational task by a physician assistant, nurse or allied health professional. This reaches significance ($p<0.01$) for nurses and '*satisfaction with last visit*' and '*information provided'*. A similar positive relationship is seen with the provision of monitoring activities by a nurse or a physician assistant, reaching the 1% significance level for physician assistants and nurses for '*satisfaction with last visit'* and '*information provided'*, and for nurses also for '*satisfaction with care provider'*. Conversely there is a significant negative coefficient ($p<0.01$) for all three measures of satisfaction for allied health professionals providing monitoring and for pharmacists providing monitoring with *'satisfaction with care provider'*.

There is a weak ($p<0.05$) positive association between all three satisfaction measures and respondents experiencing care in countries categorized as having 'innovative service models' compared to traditional or centralized models, and significant ($p<0.01$) negative coefficients for all three satisfaction measures and respondents experiencing care in countries categorized as having a ' physician-centered model'. In general being older is weakly associated ($p<0.05$) with being more likely to be satisfied (all three measures), as is having co- morbidities and 'satisfaction with care provider' whilst negative coefficients are associated with '*satisfaction with information provided*' and being employed.

The model including *'satisfaction with care provider'* as a dependent variable, shows the highest pseudo R-squared (5%) although difference across all three models are small.

TABLE 2 [insert here]

Heart disease

Table 3 below shows the results of the ordered logit models for the respondents with heart disease for the three different satisfaction measures. Compared to care provided by medical staff, these are overall less robust than for the respondent with breast cancer with no significant positive coefficients for educational activities. There is a negative coefficient ($p<0.01$) for '*satisfaction with care provider*' when nurses provide educational activities, and for *'satisfaction with last visit'* and '*satisfaction with information received'* when pharmacists provide educational activities. Similarly there is a weak negative association ($p< 0.05$) with '*satisfaction with care provider'* when physician assistants provide educational activities.

When monitoring activities were considered, there was little variation across providers for any of the three satisfaction measures. The only association was a weak negative correlation co-efficient ($p<0.05$) for '*satisfaction with last visit*' when nurses delivered care. For all three satisfaction measures, respondents were more likely to be satisfied ($p<0.01$) if they were educated to degree level, or based in countries with either innovative or traditional service models (compared to centralized service models). There were no other statistically significant relationships. The model including *'satisfaction with last visit'* as dependent variable, shows the higher pseudo R-squared (9%).

TABLE 3 [insert here]

Type 2 diabetes

Finally Table 4 below shows the results of the ordered logit model for respondents with Type 2 Diabetes. As with heart disease there few significant correlations, and none are positive. Compared to care delivered by medical staff, there is a negative association ($p<0.01$) with '*satisfaction with care provider*' when nurses, or to a weaker extent ($p<0.05$) physician associates provide educational activities, and similarly a negative association with '*satisfaction with last visit*' and '*satisfaction with information provided*' when pharmacists provide educational activities. There is a weak positive coefficient with '*satisfaction with last visit'* when nurses provide monitoring activities. Respondents receiving care in countries with innovative service models, and traditional service models are more likely ($p<0.01$) to be satisfied as assessed by all three measures compared to countries with a centralized system although in the latter group the relationship is slightly weaker reflected by the lower coefficients. Finally those educated to degree level were more likely to be satisfied ($p<0.01$) as assessed by all three measures. The model including '*satisfaction with last visit'* as the dependent variable, shows the higher pseudo R-squared (6%) although difference across all three models are small.

TABLE 4 [insert here]

Sensitivity analyses and regression diagnostics

The collinearity matrix estimating the Pearson indexes, did not show relevant levels of correlation between dependent variables. Regarding the misspecification analysis (see Appendix Table the results of the link test did not show significant values ($p > 0.10$ in all specifications considered) meaning that the linear assumptions of the model were likely to be correct and no relevant variables were likely to be omitted.

In all three pathways, restricted specifications confirmed the results of the full specifications (see Appendix Tables A2 – A4). For every dependent variable, in each pathway, the inclusion of interaction forms showed a negative coefficient, suggesting that patients are likely to be less satisfied when more than one different professional provides educational support or monitoring, other than for breast cancer. In this pathway this relation was weakly statistically significant ($p<0.05$) for '*satisfaction with care provider'*.

Discussion

This cross sectional study is one of the first to look at a European level on the effects on patient satisfaction of extending the health care team to involve more non-medical health care professionals in the provision of care. Our focus on three care pathways of clinical significance, breast cancer, heart disease and type 2 diabetes, has demonstrated the effect of the condition itself on patients' views. The econometric model has been shown to be robust as, tests on misspecification did not suggest that potentially relevant variables that could have impacted on the estimated functional form had been omitted. However, pseudo r-squared, always under 10%, reflects the complexity of seeking a full specification when the dependent variables are self- reported outcomes.

Limitations of the study include the well recognized challenges of interpreting self reported data, variable response rates by country and condition, and differing 'extended' roles in different countries. Furthermore, to avoid too many sub groups all titles within a professional grouping (eg general nurse, specialist nurse, advanced practice nurse) have been combined into a single grouping possibly diluting the effect of those within the profession with advanced training (eg for nurses and pharmacists) and for allied professionals combining several different professions amongst whom some will have a greater or lesser relevance to the pathway (for example the role of radiographers in breast cancer and dieticians and podiatrists in type 2 diabetes). Another limitation concerns the

creation of variables concerning (1) different professional roles; (2) countries; (3) education. So for professional roles, although questionnaires were presented in in country-specific languages which were extensively piloted, some sub-groups of professional roles are not formally recognized or even exist in every country. Furthermore when they do exist, there is no agreed definition for, or universally applied, professional qualification or job title to describe them [19]. We were aware of this problem when developing the questionnaires, and grouping professionals in macro-groups in our analyses (i.e. nurses, pharmacists, medical doctors) increased robustness in the creation of our variables, partially solving this problem. Further research should address this potential limitation by focusing on single tasks and/or specific roles. Secondly we decided to group countries according to the level of innovation of patient – centered delivery models in order to address the heterogeneity in the number of country-specific observations. Controlling for country specific dummies would have implicitly taken into account cultural differences that have not been considered in our groups. For example, patients from Italy and Norway, that were grouped together, could have different cultural approaches in the way they experience care and healthcare.

Concerning the third point we decided to dichotomize the data by using a dummy variable based on holding a bachelor degree or not. Lower educated persons tend to have less health management skills, are more often sick and have a shorter life expectancy. However, this does not refer to those with middle education so that our dummy variable could have undervalued this effect as middle educated were grouped together with lows.

Concerning the breast cancer pathway, the provision of both monitoring and education by nurses was associated with higher levels of satisfaction. This could reflect that for a diagnosis such as breast cancer, with its psychological impact, there is a preference for being attended to by a female professional (the high majority of nurses). Furthermore in the UK and The Netherlands specialist breast care nurses have been a core part of the multidisciplinary team for some time and are highly valued [11]. For breast cancer it was also shown that there was greater satisfaction from respondents in countries categorized as having innovative service models and deploying more new professionals and professional roles.

In heart disease, patients still perceive the support of medical staff as key drivers for high levels of perceived quality of care. Both countries experiencing high involvement levels of new professional roles and in transition from traditional healthcare deliveries were associated with high levels of satisfaction thus suggesting that, also in those countries where professionals other than medical staff have been assigned and trained for new roles (e.g. the echocardiogram technician), this is well received by the patients.

Finally in type 2 diabetes patients, the role played by allied professionals, could reflect the increased awareness of a healthy diet and monitoring for retinal damage and podiatry check to reassure on circulatory problems and the roles of dietitians, optometrists, retinal scanners, and podiatrists. As with heart disease, respondents from countries with an innovative service models were more likely to be satisfied.

In our sensitivity analysis we tested for the inclusion of interaction forms in the model, to investigate whether being provided with monitoring and educational activities by more than one professional could have a positive (negative) impact on patients' perceived quality of life. In each estimation across the three pathways we found a negative association (not significant) between these forms and levels of satisfaction, thus suggesting that providing monitoring and education by more than one professionals can be potentially perceived as a determinant for lower levels of coordination and integration of healthcare and thus, negatively influencing quality of care.

The associations suggested in this observational study should encourage policy makers to use the wider health care team in the delivery of care without fear of negative patient feedback on the quality of care received. This is reassuring for countries such as England, Scotland and the Netherlands where this is already declared policy. It also provides a good incentive for countries like Italy where the task substitution from medical staff to other professionals (e.g. nurses) is perceived as a necessity due to budget constraints and medical staff shortages, but there are still cultural barriers that slow down this process at least in some regions (with the Northern Italy being more keen on involving new health professional roles in some disease pathways [20-22]).

Conclusion

Despite the limitations of this study, a pattern has emerged which suggests that in general new professionals and new professional roles do not negatively impact on patient satisfaction. Where an effect is seen, this is more likely to be one of increased rather than decreased satisfaction.

However, the involvement of pharmacists and allied professionals is not always evaluated positively. Perhaps the reason could be that patients need to get used to new roles, since respondents in countries categorized as having innovative service models experienced higher levels of satisfaction in our study. The most important reason why policy makers should pursue the implementation of new professional roles in the healthcare sector remains the potential to control costs and rationalize the use of scarce resources enhancing productivity levels (e.g. reduction of waiting lists, decrease in the re-admission rates). This is even more relevant for chronic conditions involving a growing old population [21]. Nonetheless it should be remembered that satisfaction is

also very context, location and individual provider specific and detailed ongoing monitoring of patient satisfaction and other patient outcomes is essential when such fundamental changes are introduced.

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Table 1. Subscripts, variables and coefficients

Subscripts		
Name	**Description**	**Labels**
n	determinants of satisfaction	(a) satisfaction with last visit; (b) satisfaction with care provider; (c) satisfaction with information provided
P	pathway	(a) Type 2 diabetes; (b) Hearth disease; (c) Breast cancer

Variables			
Name	**Type**	**Values**	**Description**
SAT	Discrete variable	1-3	satisfaction indicator associated with determinant n in pathway P
EDUPHAS	Dummy variable	0-1	Education provided by physician assistant (YES =1)
EDUNS	Dummy variable	0-1	Education provided by nursing staff (YES =1)
EDUPHAR	Dummy variable	0-1	Education provided by pharmacists (YES =1)
EDUALP	Dummy variable	0-1	Education provided from allied professionals (YES = 1)
MONIPHAS	Dummy variable	0-1	Monitoring activities provided by physician assistant (YES = 1)
MONINS	Dummy variable	0-1	Monitoring activities provided by nursing staff (YES = 1)
MONIPHAR	Dummy variable	0-1	Monitoring activities provided by pharmacists (YES = 1)
MONIALP	Dummy variable	0-1	Monitoring activities provided by allied professionals (YES = 1)
FEMALE	Dummy variable	0-1	Patient is female (YES =1)
BACHELOR	Dummy variable	0-1	Patient holds at least a bachelor degree (YES = 1)
AGE	Continuous variable	1885	age of patient (years)
AGESQ	Continuous variable	324-7225	Age squared of patients (to allow for quadratic specifications)
EMPLOYED	Dummy variable	0-1	Dummy variable explaining whether patient employed (YES =1)
CCI	Dummy variable	0-1	Charlson index, explaining whether the patient is experiencing soe comorbidity (YES =1)
COUNTRY1	Dummy variable	0-1	Dummy variable explaining whether patients belong to England, Scotland, or The Netherlands(YES =1)
COUNTRY2	Dummy variable	0-1	Dummy variable explaining whether patients belong to Italy, Germany or Norway (YES =1)

Coefficients	
α	intercept of the model
β	variable-specific beta coefficients
ε	random error

Table 2. Ordered logit, Breast Cancer

Covariates*	**Dependent variables**		
	satisfaction with last visit	*satisfaction with care provider*	*satisfaction with information provided*
EDUPHAS	0.353	0.184	0.227
EDUNS	**0.582****	*0.432* ◊	**0.469****
EDUPHAR	-0.223	*-0.426*◊	-0.195
EDUAP	0.223	0.372	0.134
MONIPHAS	**0.864****	**0.691****	*0.535*◊
MONINS	**0.821****	**0.659****	**0.751****
MONIPHAR	-0.314	**-0.574****	-0.236
MONIALP	**-0.601****	**-0.705****	**-0.601****
BACHELOR	0.061	0.164	0.031
EMPLOYED	-0.271	-0.299	*-0.359*◊
AGE	*0.0134*◊	*0.015*◊	*0.015*◊
AGESQ	0.036	0.021	0.083
CCI	0.0425	*0.091*◊	0.006
COUNTRY1	*0.416*◊	*0.427*◊	*0.471*◊
COUNTRY2	**-0.787****	**-1.037****	**-0.791****
Pseudo R2	4.6%	5.4%	4.1%

*For definition of the co-variate labels see Table 1

****Bold type: p(t)<0.01**

◊Underlined italicized type: p(t)< 0.05

Table 3. Ordered logit, Heart Disease

Covariates*	Dependent variables		
	satisfaction with last visit	*satisfaction with care provider*	*satisfaction with information provided*
EDUPHAS	-0.571	*-0.731*	0.123
EDUNS	-0.154	**-0.418**	-0.087
EDUPHAR	**-0.442**	-0.266	**-0.551**
EDUAP	-0.531	-0.084	-0.164
MONIPHAS	-0.512	-0.307	-0.645
MONINS	*0.376*	0.124	0.315
MONIPHAR	0.371	0.392	0.432
MONIALP	-0.0003	-0.096	-0.32
FEMALE	0.0988	0.134	-0.047
BACHELOR	**0.798**	**0.613**	**0.791**
EMPLOYED	-0.136	-0.0013	-0.202
AGE	-0.0018	-0.003	-0.002
AGESQ	-0.005	-0.004	-0.008
CCI	0.0047	0.002	-0.001
COUNTRY1	**1.931**	**2.244**	**1.707**
COUNTRY2	**1.936**	**1.921**	**1.552**
Pseudo R2	8.9%	6.9%	6.3%

*For definition of the co-variate labels see Table 1

****Bold type: p(t)<0.01**

◊Underlined italicized type: p(t)< 0.05

Table 4. Ordered logit, Type 2 diabetes

Covariates*	Dependent variables		
	satisfaction with last visit	*satisfaction with care provider*	*satisfaction with information provided*
EDUPHAS	-0.65	-0.282	-0.367
EDUNS	0.275	0.253	0.313
EDUPHAR	0.342	0.245	0.282
EDUAP	0.092	0.037	0.237
MONIPHAS	-0.198	-0.418	-0.316
MONINS	0.338	0.039	0.144
MONIPHAR	0.244	0.018	0.014
MONIALP	0.467◊	0.406	0.132
FEMALE	**-0.482****	-0.321◊	-0.271
BACHELOR	-0.251	-0.064	0.005
EMPLOYED	-0.013	-0.06	-0.035
AGE	**0.018****	0.014◊	0.016◊
AGESQ	0.025	0.145	0.065
CCI	-0.03	-0.036	-0.043
COUNTRY1	**1.246****	**1.546****	**1.042****
COUNTRY2	0.508◊	0.314	**0.817****
Pseudo R2	6.1%	5%	4.1%

*For definition of the co-variate labels see Table 1

****Bold type: p(t)<0.01**

◊Underlined italicized type: p(t)< 0.05