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Implementation, Development and Regionalization of a Tele Spirometry System to Improve the Early Diagnosis of COPD. 5-Year Results

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Abstract

The high level of underdiagnosis in COPD, which is around 75%, entails a great loss of opportunity to reduce the natural evolution of the disease, to identify subjects susceptible to develop more advanced stages of COPD and to lose therapeutic resources (early smoking advice and pharmacological treatment). Spirometry is a fundamental tool for the diagnosis and monitoring of respiratory diseases and is essential for the diagnosis of COPD (FEV1 / FVC ratio <0.7 in post-bronchodilation spirometry). We have established a COPD screening plan using telespirometry (TES) in the primary care network. Getting to improve the underdiagnosis and correct misdiagnoses. In addition, greater equality and access in the different territories, improvement in treatments and avoiding unnecessary referrals to specialized care.

Abbreviations: PC: Primary Care; IPCC: International PC Classification; TES: Telespirometry; EMR: Electronic Medical Record.

Introduction

The high level of underdiagnosis [1,2] in COPD, which is around 75%, entails a great loss of opportunity to reduce the natural evolution of the disease, to identify subjects susceptible to develop more advanced stages of COPD and to lose therapeutic resources (early smoking advice and pharmacological treatment) [3-6]. Spirometry is a fundamental tool for the diagnosis and monitoring of respiratory diseases and is essential for the diagnosis of COPD (FEV1 / FVC ratio <0.7 in post-bronchodilation spirometry) [7,8].

On the one hand, its use and extension in Primary Care (PC), for many reasons (need for adequate equipment, quality control, maintenance, logistics, guarantees in its performance, continuous training, interpretation, etc.), is still deficient [9-14]. This variability in the performance of spirometry has negative consequences in the treatment of COPD in PC [3,5]. On the other hand, the quality of the siprometry is far from being the desired one, so there are numerous training experiences reported to improve the performance and interpretation of spirometries with variable results after the training actions [15-18]. Recently, new formulas are being reconsidered in their implementation and development in accordance with new technologies, with new proposals for telemonitoring in the realization and control of SEs, in different areas, through the use of online and computer networks to improve the control of the same [19-23].

In the autonomous community of La Rioja, according to the International PC Classification (IPCC) database, there are 3501 (2.6%) records or episodes classified as COPD in PC. With a population in La Rioja of 139,028 inhabitants

between 40 and 80 years old, transferring a COPD prevalence of 10.2%, we obtain as a result that 13,902 citizens have spirometric COPD, of which 10,427 (75%) are undiagnosed. In La Rioja, the shared Electronic Medical Record (EMR) of the patient, called SELENE, has been implanted and with a very advanced stage of development. It has computerised access to it from any point of the healthcare network (Health Centers and Hospitals).

Since 2011, a new model of Telespirometry (TES) has been regionalized, implemented and developed so that the test is incorporated into the electronic history of each patient, so that it can be accessed from any point of the healthcare network, facilitating coordination and collaboration between levels of care, since a report is made by a specialist care professional. Furthermore, TES are carried out with appropriate quality according to the criteria of standardization, calibration, acceptability and reproducibility established in the National COPD Strategy, as they are carried out in two Telematic Spirometry Units for the different health centers in La Rioja.

Objectives

Main objective

To improve the early diagnosis of people with COPD.

Specific objectives

a) To integrate the application of telespirometry in the Common Electronic Medical Record of the Public Health System of La Rioja.
b) To facilitate the interpretation between the levels of Primary Care and Specialized Care in the use of the test, ensuring the control and monitoring of its quality.
c) To improve equity, guarantee of results and efficiency in the performance of the test.
d) Descriptive analysis of the population in which a spirometry is performed.
e) To assess the treatment of this population before and after spirometry.

Population

Target Population

Patients recruited by health professionals (family medicine and community nursing) of the Primary Care Teams of the Health Centers of Rioja Centro (CS Alberite, Camero Nuevo, Camero Viejo, Cascajos, Espartero, Gonzalo Berceo, Joaquin Elizalde, Labradores, Murillo Rio Leza, Nájera, Navarrete, Rodríguez Paterna, Siete Infantes, La Guindalera) and Rioja Alta (Haro, Santo Domingo Calzada)

Recruitment Criteria

Person or patient aged 40 or older, presenting a history of smoking (current or past), regardless of their health state.

Resources Involved

PC Nurses and Medical Professionals, PC Pediatricians and Pulmonology. Creation of two Primary Care Telespirometry Units with SERIS own resources.

Methods

The objective is to implement and integrate the application of telespirometry in the single digital medical record (SELENE) of the Riojan Health Service (SERIS). As well as, to facilitate the interpretation between the levels of PC care and Specialized Care (SC) in the use of the test, ensuring the control and monitoring of its quality. Compatibility of PDF files generated by the spirometer with the SELENE computer system. Software generation and computer integration for the management of protocols and menus for requesting, citing, performing, generating the report by specialized care and receiving spirometry through SELENE in primary care and specialized care. Statistical analysis of the telespirometries performed from 2011 to 2015, descriptive analysis of the population, of the results of the spirometry values and their treatment before and after the test (Figure 1).

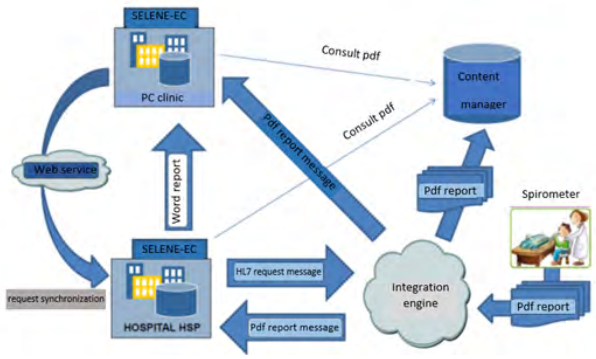


Figure 1: The application of telespirometry in the single digital medical record (SELENE) of the Riojan Health Service (SERIS).

Results

With the Implantation-Integration of TES in the Patient's EMR, we have achieved

a) To regionalize and create two new advanced telematic Units for Respiratory Functional Exploration in Primary Care in coordination with Specialized Care for Rioja Centro and Rioja Alta.
b) Those Units meet all the basic standardization criteria (adequate space, organizational criteria, hygiene guarantees, calibration, acceptability criteria,

reproducibility) for carrying out the TES.

c) Once the integration in SELENE is achieved, the TES can be consulted from any point (work center) through a computer.

d) This facilitates with respect to the previous situation: the loss of information, guarantees equity and access under conditions of equality to the test, quality, efficiency and continuity of care between levels.

e) A plan has been created to guarantee the continuity of the organizational criteria (specific training plans for technicians and doctors).

f) To facilitate spirometry as a diagnostic and control tool for respiratory diseases for primary care doctors.

g) Spirometries performed from 2011 to 2015 were analyzed.

A Total of 2,042 Spirometries were Performed

The average age is 55.34 years + - 17.08, where the 51.72% are male, BMI: average 27.48 +/- 5.43. Smoking habit: 43.84% are smokers, 24.31% are non-smokers, 31.61% are ex-smokers (Figure 2).

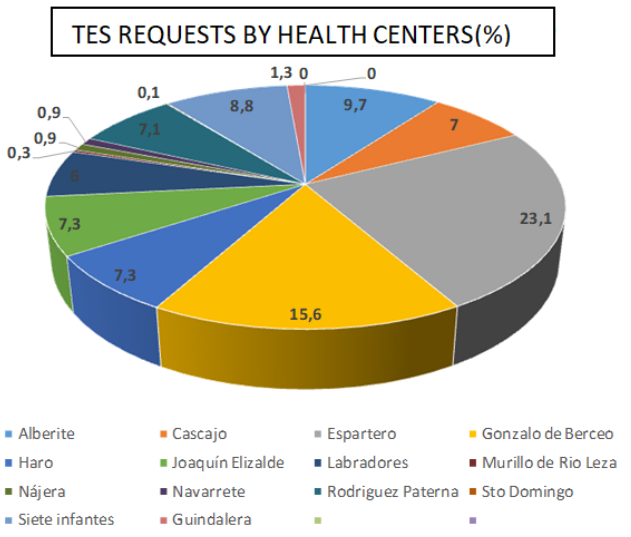


Figure 2: TES Requests by Health Centers (%).

The options for which the Primary Care's doctor can request spirometry are

- Obstructive disease request (a total of 1988 patients):
- COPD screening: 61.9%, COPD control: 9%, Bronchiectasis: 0.9%, Asthma: 28.2%
- Restrictive disease request (a total of 32 patients):
- Pulmonary fibrosis: 37.5%, Thoracic disease: 46.9%, Neuromuscular disease: 15.6%
- There were 3 patients preoperatively, 0.21% of the total spirometries.
- Only 26.92% had previous spirometry.
- The TES request has been increasing exponentially each time by the PC doctors:
- Year 2011: 186 TES (9.1%), year 2012: 196 TES (9.6%), year 2013: 412 TES (20.1%), year 2014: 606 TES (29.7%), year 2015: 642 TES (31.4%).
- GLOBAL results of the telespirometries analyzed: Normal (72.82%), Obstructive (22.75%), Restrictive (2.07%), Mixed (1.07%), Not assessable (1.29%).
- In obstructive spirometries (out of a total of 502 patients): mild: 46.43%, Moderate: 46.13%, Severe: 7.14%, Very severe: 0.3%
- Degree of restriction (31 patients): Mild: 75%, Moderate: 20%, Severe: 5%.

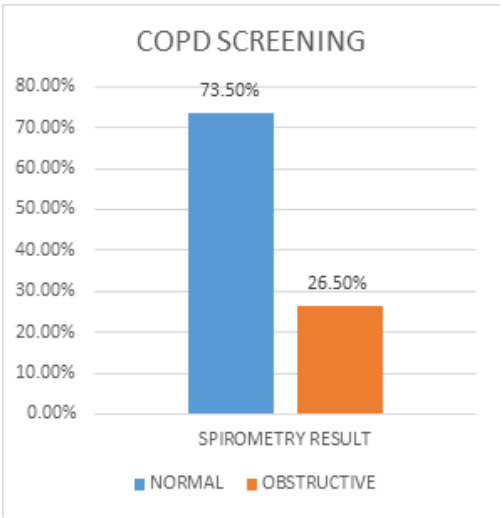
Obstructive Disease

COPD Screening Results

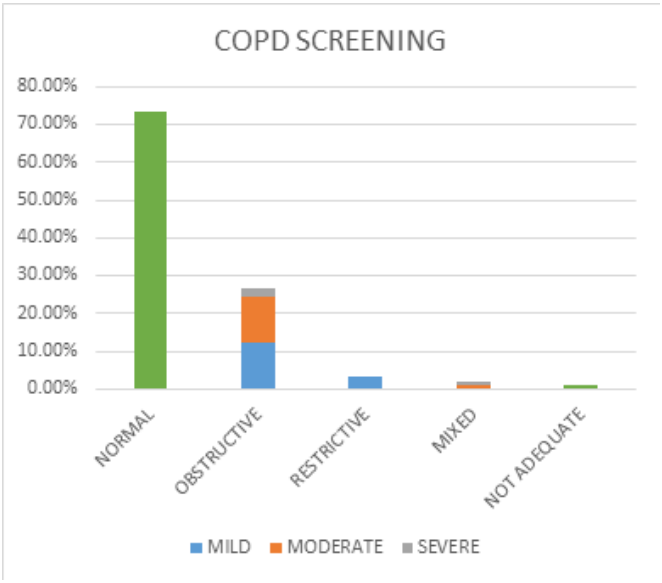
A total of 1,230 telespirometries were requested for COPD SCREENING, age 58.45 +/- 13.63, men 57.5%, BMI: 27.7 +/- 5.2, SMOKING HABIT: Smokers 59.5%, Non-smokers 2%, ex-smokers 38.5%.

The mean lung function values +/- standard deviation were:
FEV1/FVC 62.1 ± 9.14
FEV1 ml 2029.5 ± 706.96
FEV1 (%) 76.73 ± 17.83
FVC ml 3207.92 ± 1046.79
FVC (%) 100.6 ± 57.62

Of these 326 were obstructive, i.e. 26.5% (of these 24.8% have a positive BD test). Of them, 77.6% had no previous spirometry. 3.3% had mixed or restrictive pathology. 98.7% of spirometries were correctly performed (Graph 1).



Graph 1: Ratio of obstructive vs normal spirometrier.



Graph 2: Breakdown of the results of the spirometries performed.

Of the obstructive: 46.2% are mild, 45.3% are moderate, 8.4% are severe.
Of the total number of patients diagnosed with COPD, 11.7% had treatment prior to diagnosis and 80.3% did not have:
LAMA = 50%, LABA = 4.5%, LAMA + LABA = 27.3%, LABA + IC = 13.6%, LABA + IC, LAMA = 4.5%
After diagnosis, 181 patients (55.9%) started treatment, 143 (44.1%) did not start.
LAMA: 36.8%, LABA: 7.6%, LAMA + LABA: 22.7%, LABA + IC: 24.3%, LABA + IC, LAMA: 8.6%

Treatment According to the degree of COPD

Mild COPD

Treatment is started in 66 patients (41.7%) and not started in 91 (58.3%):
LAMA (long acting anti-muscarinics agents): 36.4%, LABA (Long-acting β adrenoceptor agonists): 6.1%, LAMA+LABA: 15.2%, LABA+IC (INHALED CORTICOIDS): 31.8%, LABA+IC, LAMA: 10.6%.

Moderate COPD

Treatment is started in 101 patients (69.2%) and not started in 45 (30.8%):
LAMA: 35.6%, LABA: 9.6%, LAMA+LABA: 21.2%, LABA+IC: 21.2%, LABA+IC, LAMA: 5.8%.

Severe COPD

Treatment is started in 14 patients (73.6%) and not started in 5 (26.3%):
LAMA: 42.9%, LABA: 0%, LAMA+LABA: 21.4%, LABA+IC: 14.3%, LABA+IC, LAMA: 21.4%.

Results of COPD Control

Of the 178 patients who underwent spirometry for COPD control (they were cataloged for this pathology in their PC history) 71 patients had normal spirometry, i.e. 39.8% were not really COPD. Of the patients with obstructive pathology in spirometry (60.2%), the classification according to grade was: 38.1% mild obstruction, 49.5% moderate obstruction, 11.4% severe and 1% severe.

The descriptive characteristics of these patients are age: 67.04 +/- 12.5, IPA: 44.71 +/- 26.43.
Spirometric values:
FEV1/FVC: 59.67+/-8.9
FEV1 ml: 1759 +/-612.53
FEV1 %: 71.04 +/-19.5
FVC ml: 2873.26+/-849.22
FVC %: 91.13+/-19.31

Of these patients, 45.6% had previous treatment and 54.4% were not. The treatment they presented was:
LAMA: 22.6%, LABA: 3.2%, LAMA+LABA: 9.7%, LABA+IC 41.9%, LABA+IC+LAMA: 22.6%.
Of the patients with normal spirometry (68 patients):
45.6% took previous treatment and 54.4% did not take previous treatment.
The previous treatment that these patients were taking was:
LAMA: 22.6%, LABA: 3.2%, LABA+LABA: 9.7%, LABA+IC: 41.9%, LABA+IC+LAMA: 22.6%.
Of these patients who had normal spirometry, treatment was only withdrawn in one case: 3.2%, and treatment was maintained in 96.8% despite the normality of spirometry.

Asthma Result

Of a total of 561 spirometries for suspected asthma, 69 have been obstructive, i.e. 12.3% (64.5% mild obstruction and 35.5% are moderate) and 15.6% have positive bronchodilation.

Bronchiectasis Result

Out of a total of 18 spirometries for bronchiectasis, 5.5% were obstructive in a severe degree and one, the 5.5%, restrictive. The rest were normal.

Restrictive Disease

Results of requests for pulmonary fibrosis

12 spirometries were for pulmonary fibrosis screening, of which only 1 was restrictive (8.3%), 2 obstructive (16.6%) of moderate degree.

Thoracogenic disease

15 spirometries were for suspected thoracogenic disease, of which 4 of them were restrictive (26.6%), these were 75% mild and 25% moderate. 6% were not assessable.

Neuromuscular disease

Five spirometries were requested for suspected neuromuscular pathology, and 100% were normal.

Preoperative Study

Three spirometries were ordered for preoperative study, and 100% were normal.

Discussion

We have successfully implemented a pioneering and innovative telematic program, coordinated between healthcare levels, where the TES and its report are integrated into the Electronic Medical Record of patients in SELENE. With the implantation-integration of the TES and report in the patient's EMR, we have achieved to create two new and advanced telematic Spirometry Units for PC in coordination with EC. These Units meet all the basic standardization criteria (adequate space, organizational criteria, calibration, acceptability criteria, reproducibility) for the performance of the TES.

This has made it easier, with respect to the previous situation, to improve equity and accessibility to the right to provide health services under the same conditions of equality for all citizens for this test. Improvements in the result quality guarantees, report of the test and higher levels of efficiency. The project has contributed to improving the underdiagnosis of COPD by detecting 26.5% of TES requested for COPD screening with airflow obstruction, most of which are mild and moderate. In addition to the benefit of having any family doctor in our community with a key tool for the diagnosis and monitoring of respiratory diseases. We have achieved that a greater number of spirometries are performed in PC and that most of the studies have an adequate quality and that with the test report, more accurate clinical decisions can be made based on them. Other side benefits have been the decrease in inappropriate referrals to Specialized Care.

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