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ORIGINAL ARTICLE

# Feasibility testing of the Core set of quality Indicators for Paediatric Primary Care in Europe, COSI-PPC-EU

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## Abstract

There is a need to measure and improve the quality of paediatric primary care in Europe where major differences in the delivery and outcomes of child health care exist. A collaborative panel of paediatric senior experts developed a Core Set of Indicators for Paediatric Primary Care in Europe by compiling 42 quality indicators in a modified consensus process following the RAND/UCLA appropriateness method. The aim of this study was to explore the feasibility of the quality indicator set in European paediatric primary care practices. Seventy-nine practices from eight countries participated in a detailed online interview. The practices rated the applicability, relevance, reliability and acceptance of the 42 quality indicator as well as the availability, technical feasibility and effort to retrieve the needed data from their medical records. Most quality indicators were considered applicable, available, reliable, acceptable and relevant for monitoring quality of care in paediatric primary care. Respondents rated feasibility and effort to retrieve the data lowest because of difficulties collecting the data from the medical records.

*Conclusion*: European paediatric primary care practices generally agree with the proposed quality indicator set. They document most of the parameters. However, the collection of specific needed values from available routine patient-data is considered technically difficult and time-consuming.

**What is Known?**

- *Paediatric primary care systems in Europe show striking differences in their performance. Pre-existing sets of quality indicators are predominantly limited to national populations, specific diseases and hospital care.*
- *A Core Set of 42 quality indicators for paediatric primary care in Europe was developed by European paediatricians using a systematic literature review and a consensus process following a modified RAND/UCLA appropriateness method.*

**What is New?**

- *Paediatric primary care providers in Europe agree with the idea to use COSI-PPC-EU to monitor and improve the quality of care. The set was considered applicable, available, reliable, acceptable, and relevant for quality improvement.*
- *The score for feasibility and effort to retrieve the data was low, because of technical reasons; the electronical or paper-based medical documentation in most cases does not allow convenient access to all necessary data.*

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**Keywords** Quality indicator · Quality improvement · Paediatric primary care · Community child care · Europe · Benchmarking EAP · ECPCP · Feasibility study

**Abbreviations**

| | |
|---|---|
| CME | Continuing medical education |
| COSI-PPC-EU | Core Set of Quality Indicators for Paediatric Primary Care in Europe |
| DGAAP | German Academic Society for General Paediatrics |
| EAP | European Academy of Paediatrics |
| ECPCP | European Confederation of Primary Care Paediatricians |
| EDP | Electronic Data Processing |
| EMD | Electronic Medical Records |
| EU | European Union |
| IBM-SPSS | SPSS Statistics is a software package used for statistical analysis from the IBM Corporation |
| ICD | International Classification of Disease |
| MOCHA | Models of Child Health Appraised Project |
| NICE | National Institute for Health and Care Excellence, UK |
| PPC | Paediatric Primary Care |
| QI | Quality Indicator |
| QM | Quality Management |
| RAM | RAND/University of California Los Angeles Appropriateness Method |

## Introduction

European health care systems do not provide consistent high-quality care to all people in all European countries [30]. Paediatric care in Europe (EU) shows striking discrepancies, inequalities and diverse outcomes [4]. The circumstances under which paediatric teams in Europe perform their tasks in Paediatric Primary Care (PPC) are diverse [8]. This, in turn, has an impact on the medical quality and the results of PPC [10, 34]. To analyse the discrepancies in European health care systems and to learn from better performing countries a set of broadly accepted and feasible quality indicators (QI) is indispensable [10, 34].

A number of valuable paediatric QI sets have already been developed. So far, none of these sets make it possible to compare European countries on the needs of primary care practices that treat children and adolescents. The previous QI sets are aimed at measuring and comparing the treatment of specific medical conditions, as pars pro toto may serve asthma [33] or diabetes [26]. Gill et al. set up a comprehensive paediatric QI set, developed together with and for general practitioners in the British National Health Service, which contains pay-for-performance elements [14]. In this context, QI are used for quality assurance at the regional or national level. However, in order to use QI transnationally, one needs to allow for differences in professional cultures or clinical practices. This calls for an intermediate process [25]. The intermediate process we performed to be able to compare and improve the quality of care across systems in all European countries was to develop the Core Set of Indicators for PPC in Europe (COSI-PPC-EU) [12].

Between 2011 and 2014 the European Academy of Paediatrics (EAP) and the European Confederation of Primary Care Paediatricians (ECPCP) developed and published COSI-PPC-EU. The set was compiled by a consensus process, which followed the RAND/UCLA appropriateness method (RAM) [13]. The 42 COSI-PPC-EU QI cover PPC tasks in five categories: (A) Health Promotion/Prevention/Screening (13 QI), (B) Care of Acute Diseases (9 QI) and (C) Care of Chronic Diseases (8 QI), as well as (D) Practice Organisation (3 QI) and (E) Patient Safety (9 QI). The set combines the three quality dimensions according to Donabedian, namely structure, process and outcome quality [7].

Quality indicators serve to compare health care systems and institutions [21]. For the development and implementation of QI, recommendations are made in order to verify quality in terms of suitability, validity, reliability and feasibility [1, 20, 27]. Feasibility testing is a challenge for all QI sets because before using QI in practice, it must be shown whether the data for the calculation of the QI can be collected technically and at a reasonable price. Wollersheim et al. showed in 2007 that between 10% and 20% of the data for newly developed clinical indicators was not collectable and thus not measurable [35]. Therefore, the implementation of newly developed QI always requires the scientific investigation of their feasibility—along with the proof of validity and reliability [17, 19, 28, 29, 31].

The data for the calculation of the COSI-PPC-EU should be available in the individual practices because the QI are based on international treatment guidelines of the European medical-scientific societies. Presumably, this is computer-aided in most cases. If the collection and computation of the COSI-PPC-EU from these data sets is possible, the next questions are whether or not the technical and temporal effort for the extraction of the data is possible and are the physicians willing to provide this service.

The first two COSI-PPC-EU project phases 2011–2014 were finished with an evaluation of the medical relevance and feasibility of the QI set by an expert panel. The present study examines the feasibility and effort of data collection to

calculate the QI directly in the PPC practices of selected European countries.

## Method

### Definition of feasibility

In the literature the term "feasibility" is not clearly defined. In general, feasibility refers to practical measures or "presumed practicability" [32] in the respective technical context of QI [1, 3, 24]. In the selection and definition of QI, there may be an inherent tension between feasibility, which is generally improved by simplicity, and the validity that is generally improved by considering clinical complexity [28]. Feasibility is usually assessed in expert consensus processes using a Likert scale [14, 16, 22]. This means that the results are only an estimate of panel participants' opinions and are dependent on the appropriate selection of the panel. This does not replace a practice test by a group of pilot professionals [19]. To assess feasibility, the concept has to be operationalised on the basis of certain criteria. However, a universal and internationally accepted set of feasibility criteria is not available. Therefore, we used a modified set of criteria that had been used in previous studies focusing on feasibility testing of QI in ambulatory care [1, 3, 5, 24, 28]. The seven criteria describing the feasibility of the COSI-PPC-EU are depicted in Table 1.

Based on these feasibility criteria, a sample of paediatric primary care providers from the ECPCP Member States were asked to evaluate COSI-PPC-EU. Participants were asked if the QI data sets are available, from the point of view of the physicians if it is applicable as QI, and with what effort they could be collected in their medical practices.

### Survey instrument

The survey questionnaire was developed as an Excel database for data input and analysis of the practices' ratings. Subsequently, it was evaluated in each of the participating countries as a pilot test in at least one doctor's office. For each of the 42 QI, its numerator and its denominator, participants had to answer one to four questions on each feasibility criterion. All together participants had to answer 840 questions plus additional 17 questions in relation to their practice characteristics. In addition, respondents could add promoting or hindering factors for retrieving QI data and characteristics of the practice as free text. In spite of the huge number of questions to answer, in the pilot test, a time of approximately 90 min was found to be necessary to answer the survey. This may be due to the fact that participants had to tick boxes in 42 identically composed Excel worksheets only. Table 2 depicts the questions answered for each QI.

### Study conduct

Initially, the delegates of each ECPCP member country looked for an interested and committed volunteer who acted as country coordinator. Each of them was to motivate 10 physicians working in PPC to participate in the study. As far as the study management is aware of, neither the country coordinators nor the participants received financial or other compensation for their efforts.

Due to the qualitative descriptive nature of the analysis, the PPC practice sample was not selected randomly in each country. However, country coordinators were asked to select practices that represent a broad range of organisational and structural practice characteristic for each of the countries. The study design accepted the fact that the limited recruitment and composition of the sample could be a limitation for the analysis.

The country coordinators themselves tested the questionnaire as part of the pilot test. Their proposals for technical improvement and formulation of the study tool have been adopted for all countries. If a participant needed a translation of the questionnaire from English, it was done by the country coordinator. The study management has no indication that this was necessary for any participant or that the questionnaires were changed. The country coordinators were responsible for meeting the set timeframe and for sending the completed questionnaires from their country to the coordinating study centre.

**Table 1** The seven criteria used to operationalise "feasibility" modified from [5]

- Applicability of each QI in PPC practices
- Availability of data needed for each QI in PPC practices
- Feasibility of data collection in the sense of user friendliness and user competency to collect the data for the QI with numerator and denominator
- Effort to collect the data, especially in the sense of reasonable time within a day-to-day-routine
- Relevance of the indicator for PPC quality from the respondent's point of view
- Reliability of data collection for QI calculation
- Acceptance of the QI by paediatricians

**Table 2** The feasibility-study questionnaire, exemplary for the quality indicator A05 "Tracking of newborn metabolic screening"

| Indicator information | |
|---|---|
| No | A05 |
| Indicator Category | Health Promotion/ Prevention/ Screening |
| Indicator Subject | Tracking of newborn metabolic screening |
| Indicator Focus | Timely verification of accomplished newborn metabolic screening |
| Indicator Numerator | Number of patients who received metabolic screening in hospital or at primary care provider |
| Indicator Denominator | All infants in the first 10 days of life |
| Please, answer following questions concerning the above QI: | |
| 1. Applicability | |
| a) Does your PPC practice regularly serve patients for whom this QI is relevant? | Yes/No/Not sure |
| b) Does this aspect of care or organisational feature play an important role in your PPC practice? | Yes/No/Not sure |
| c) Is this QI applicable to your practice? | Yes/No/Not sure |
| Attention: In case you answered all three questions in relation to „Applicability" with „no", you may skip the remaining questions in this worksheet and continue with the next quality indicator/worksheet. | |
| 2. Availability | |
| a) Does your practice regularly collect the QI numerator information? | Yes/No/Not sure |
| b) Does your practice regularly document the QI numerator information? | Yes/No/Not sure |
| c) If yes, is this QI numerator information documented in written, paper-based form or/and electronically? | Paper-based/ Electronically/ Not sure |
| a) Does your practice regularly collect the QI denominator information? | Yes/No/Not sure |
| b) Does your practice regularly document the QI denominator information? | Yes/No/Not sure |
| c) If yes, is this QI denominator information documented in written, paper-based form or/and electronically? | Paper-based/ Electronically/ Not sure |
| 3. Feasibility | |
| a) Is there a query function in your practice administration software that allows you to electronically retrieve the information needed for the QI numerator? | Yes/No/Not sure |
| b) If there is no electronically available information: do you easily get access to the information needed to calculate the numerator in your paper based patient documentation? | Yes/No/Not sure |
| c) Is there a query function in your practice administration software that allows you to electronically retrieve the information needed for the QI denominator? | Yes/No/Not sure |
| d) If there is no electronically available information: do you easily get access to the information needed to calculate the denominator in your paper based patient documentation? | Yes/No/Not sure |
| 4. Effort | |
| a) How much time would you approximately need to calculate this numerator for all suitable patients of one year, if you used your current documentation source for this QI? | Time (hh:mm)/Not sure |
| b) Under your given day to day practice routine, is this effort reasonable to you? | Yes/No/Not sure |
| c) How much time would you approximately need to calculate this denominator for all suitable patients of one year, if you used your current documentation source for this QI? | Time (hh:mm)/Not sure |
| d) Under your given day to day practice routine, is this effort reasonable to you? | Yes/No/Not sure |
| 5. Relevance | |
| a) Is this QI suitable to meaningfully describe the quality of care in this specific health promotion/prevention/screening aspect? | Yes/No/Not sure |
| 6. Reliability | |
| a) How do you estimate the reliability of data collection for this QI? | Excellent/ good/ fair poor/ very poor |
| 7. Acceptance | |
| a) Would you accept if the quality of PPC was measured and rated by this QI? | Yes/No/Not sure |
| 8. Additionally factors | |
| a) Are there additionally promoting factors for this QI? And if so, what promoting factors? | Free text: |
| b) Are there additionally hindering factors for this QI? And if so, what hindering factors? | Free text: |

### Statistical analysis

According to sample size estimation, data from 58 PPC practices per country would have been needed to statistically prove between-country feasibility differences at 20% points (e.g. differences from 70 to 90% QI feasibility rates; further assumptions: power 80%, one-sided chi-square test, $p = 0.05$). Unfortunately, it was not feasible under the given circumstances to study that huge number ($n = 580$). Therefore, we only performed descriptive and explorative inferential statistics to describe the feasibility of COSI-PPC-EU QI.

Data analysis was performed separately for each country and aggregated over all countries using IBM-SPSS Statistics programme. Structural features, each QI as a whole and—if necessary—each QI numerator and denominator, were analysed. Thus, descriptive analyses of all structural features and every feasibility criterion were studied and evaluated (applicability, availability, feasibility, effort, relevance, reliability and acceptance).

## Results

### Study sample

Seventy-nine PPC practices from eight ECPCP member countries participated in the study (France 11, Germany 10, Hungary 9, Israel 10, Italy 10, Slovakia 10, Slovenia 6 and Spain 13). Due to a variety of reasons (decision of coordinator or participants, lack of available time, no financial incentive, voluntary and burdensome survey), Switzerland, Austria, Cyprus and Czech Republic were not able to recruit more than two participants for the evaluation. The delegates from Finland, Lithuania, the Netherlands and Portugal decided not to attend for organisational reasons based on their national medical association and current obstacles.

### Practice structures in the study sample

The participating 79 European paediatric doctor's offices represented a wide range of different types of possible PPC practice models. Table 3 shows the detailed structure of the participating practices.

Ninety-five percent of paediatricians use Electronic Data Processing (EDP) or Electronic Medical Records (EMR), either as the sole documentation format (64.6%) or along with paperwork (30.4%). In total, 37 different software products were specified for their physician information systems.

Participants were asked about software tools in their EMR which would permit extraction of the numerator and denominator for each QI from routine patient records. The responses show that such software function is not common. On the other hand, some respondents make evident that they already use software with proper query functions and they could collect the data easily in a few minutes.

### Results of indicator assessment

The questionnaire required an assessment of the numerator, the denominator and/or the QI as a whole. For better clarity, the QI results are grouped into their categories from *(A) Health Promotion/Prevention/Screening* to *(E) Patient Safety*.

Figure 1 provides an overview of the ratings of all seven criteria of feasibility ("Applicability" to "Acceptance") (0–100%: worst/best) in relation to the five QI categories *(A)* to *(E)*.

As "applicable" for their practice the participating 79 paediatricians rated the QI in category *(A)* with 87% as the best and in *(C) Care of Chronic Diseases* with 60% as the worst. They estimated the "Availability" of the needed data with 66% for *(A)* best and with 31% for *(C)* worst.

The feasibility of data collection in the sense of user friendliness and user competency to collect the data technically had the lowest approvals in all five QI categories. Looking at the values for each QI, its numerator and denominator one by one, there is no QI that stands out. Numerator and denominator of the same QI are usually retrieved from the documentation with varying degrees of "Effort". Less than half of the participants claim that they can only collect the data through the software. Just as difficult is the query from paper documentation. To illustrate this, exemplary QI and their ratings are listed in Tables 4 and 5. Free text comments highlight these results. They are repeated in content and are summarised in Table 6 in groups.

Participants estimated the time required to collect the data for a single QI for all suitable patients for 1 year at 90 min (median).

This time seemed to be adequate for *(A)* for at least 35% of the doctors surveyed, whilst all other values were even lower. QI related to the Care of Chronic Diseases *(C)* received the lowest value at 22%.

Figure 1 also gives an overview of the results for the criteria "Relevance" (*(A)* at 76% best and *(C)* at 44% at the end). "Reliability" for all QI was rated as such by more than 50% of all participants (*(A)* 75% and *(D)* 58%), and Acceptance (*(A)* 73% and *(C)* 43%).

### Country-specific responses

Figure 2 presents the ratings of all feasibility criteria for each participating country for *(A) Health Promotion/Prevention/Screening*. Participants rated these 13 QI best in all feasibility criteria. Amongst the eight participating countries the criterion Applicability received the highest consent, namely from Italy (96%), Spain (94%) and Israel (81%). One third of the participants from Slovakia (37%) rated QI data collection as

**Table 3** Detailed structure of the participating practices

| | | |
|---|---|---|
| Median number of Paediatricians in the participating practices | 2 | Range 1 to 87 |
| Median number of medical employees | 4 | Range 1 to 650 |
| Average number of treated patients per month | 625 | Range 66 to 2400 |
| Median number of treated patients per hour | 5 | Range 1,6 to 15 |
| Median number of consultation hours per week | 35 | Range 5 to 65 |
| Number of practices located in urban environment | 68 | 86.1% |
| Number of practices with affiliation to an hospital | 10 | 12.7% |
| Medical record documentation: only EDP/EMR *) | 51 | 64.6% |
| Medical record documentation: EDP/EMR and paper-based records | 24 | 31.4% |
| Medical record documentation: only paper-based records | 4 | 5.1% |
| Practices regularly coding diseases according to International Classification of Diseases (ICD-10) | 56 | 70.9% |
| Median years of age of participating paediatricians | 53 | Range 36 to 74 |
| Number of doctors younger than 50 | 26 | 32.9% |
| Number of doctors between 50 and 55 | 28 | 35.4 % |
| Number of doctors older than 55 | 23 | 29.1% |
| Median years of professional experience as a paediatrician | 24 | Range 6 to 49 |
| Doctors with less than 20 years of experience | 24 | 30.4% |
| Doctors with 20-27 years of experience | 29 | 36.7% |
| Doctors with more than 27 years of experience | 24 | 30.4% |
| Number of practices run only by women | 42 | 53.2% |
| Number of doctors s run only by men | 16 | 20.3% |
| Average percentage of full-time employed paediatricians | 90.1% | Range 10 to 100% |

*) EDP = Electronic Data Processing; EMR= Electronic Medical Records; one practice in Spain answered not to use specialized practice administration software but is using just a common operation system (Windows). All others use software, which combines EMR and EDP

technically feasible, whereas 33% of the participants from Germany stated the ability to collect the data. Slovenia (12%), Hungary (13%) and France (16%) rated feasibility lowest.

Figure 3 shows for *(B) Acute Care* the ratings of all feasibility criteria for each participating country. The graph resembles Fig. 2 in which applicability and relevance got higher ratings, feasibility and effort lower ratings. The ratings for relevance are similar to the results for availability, reliability and acceptance. In comparison to the ratings of *(A)*, all criteria, except for applicability, were rated on average about 10% below. Concerning *(B)* practices from Slovenia estimated most of the criteria best.

The QI related to *(C) Chronic Care* were rated comparable to the Acute Care QI. Within the survey sample, country-specific differences seem to be more prominent in PPC practices from Israel and Slovakia, which rated most criteria lower than participants from other countries. On average, only 10% of the participants stated that it was feasible to retrieve the data necessary to calculate the indicators as shown in Fig. 4.

Figure 5 shows the ratings of all feasibility criteria for *(D) Practice Management* for each participating country. The three QI of *(D)* encompass different topics such as "access and equipment for the disabled", "continuing medical education (CME) for the child care team" and "participation in quality circles". Most of the participants rated them lower than all other COSI-PPC-EU QI. The majority of the participants (> 50%) assessed all feasibility criteria negative for these three QI, but country-specific differences were highest in the assessment of *(D)*.

The ratings for *(E) Patient Safety* are shown in Fig. 6. Again, feasibility and Effort were rated lowest, but Applicability was also rated in four out of eight countries much lower than in the other categories. The category includes a mixture of issues concerning patient safety like "Guideline implementation", "Documentation management", "Timely checks of drugs and vaccines expiration dates", "Checks of medical equipment and devices", "Annual training in resuscitation and managing acute emergencies" and "Handling complaints and critical incidents". The country differences were particularly striking here. In the free text answers, some participants described their country-specific regulations and whether the measures are mandatory or not (see Table 6).

An exploratory analysis of statistically significant relationships between country results and feasibility criteria did not show any decisive trend. Graphically, the different sizes of the bars (mean and standard deviations) depict some differences between countries. However, the rationale of these differences and how they relate to one another remains unclear.

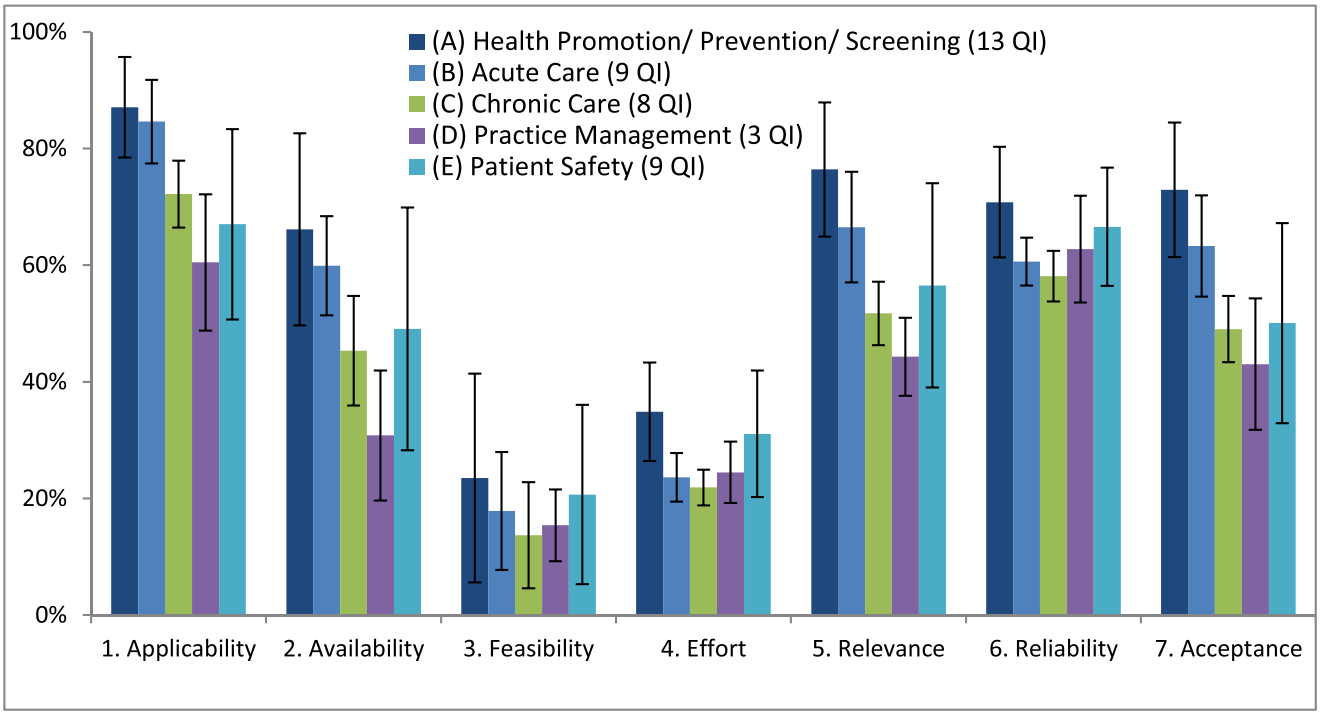


**Fig. 1** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of COSI-PPC-EU, categorised according to their focus (i.e. health promotion/prevention/screening, acute care, chronic care, practice management, patient safety); the mean and the standard deviation (SD) are indicated

**Table 4** Exemplary feasibility ratings of COSI-PPC-EU quality indicators, which contain a numerator and denominator

| Question concerning the feasibility to access the QI data | | Is there a query function in your practice administration software that allows you to electronically retrieve the information needed for the QI? | | | | | If there is no electronically available information: do you easily get access to the information needed to calculate the QI in your paper-based patient documentation? | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| QI numerator/denominator | | No | Yes | Not sure | Not specified | Total | No | Yes | Not sure | Not specified | Total |
| A09 | N: number of patients whose weight, height and BMI were measured, plotted on standardised gender-specific curves and used for nutritional advice at intervals following national standards | 23 | 45 | 8 | 2 | 79 | 8 | 13 | 7 | 50 | 78 |
| | D: all infants and adolescents | 9 | 63 | 4 | 2 | 77 | 7 | 9 | 5 | 57 | 78 |
| A10 | N: number of patients who received at least one short educational intervention/advice to quit smoking | 36 | 17 | 6 | 5 | 64 | 22 | 3 | 10 | 29 | 64 |
| | D: all adolescents | 17 | 39 | 4 | 4 | 64 | 12 | 4 | 5 | 43 | 64 |
| B04 | N: number of patients who did not receive antibiotics | 30 | 25 | 16 | 6 | 77 | 14 | 9 | 11 | 43 | 77 |
| | D: all patients with respiratory tract infection and normal respiratory rate | 22 | 40 | 11 | 4 | 77 | 9 | 9 | 10 | 49 | 77 |
| B07 | N: number of patients who were transferred to the hospital | 29 | 24 | 10 | 6 | 69 | 14 | 9 | 6 | 40 | 69 |
| | D: all patients with respiratory distress and desaturation $< 92\%$ $SaO^2$ | 39 | 17 | 9 | 4 | 69 | 17 | 8 | 7 | 37 | 69 |
| C04 | N: number of patients who regularly demonstrate their inhaler technique | 46 | 15 | 3 | 6 | 70 | 15 | 9 | 7 | 39 | 70 |
| | D: all asthma patients | 16 | 42 | 5 | 7 | 70 | 8 | 9 | 5 | 48 | 70 |
| C08 | N: number of patients whose medical records contain treatment plans for mild, moderate and severe headaches (pharmacological treatment, adjunctive therapy) and documentation of receiving written educational materials about migraine | 40 | 14 | 4 | 6 | 64 | 19 | 6 | 8 | 31 | 64 |
| | D: all patients who presented with migraine headache | 13 | 40 | 5 | 6 | 64 | 8 | 7 | 5 | 44 | 64 |

**Table 5** Exemplary feasibility ratings of categorical COSI-PPC-EU quality indicators

| Question concerning the feasibility to access the QI data | | Is there a query function in your practice administration software that allows you to electronically retrieve the information needed for the QI? | | | | | If there is no electronically available information: do you easily get access to the information needed to calculate the QI in your paper-based patient documentation? | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Categorical QI | | No | Yes | Not sure | Not specified | Total | No | Yes | Not sure | Not specified | Total |
| A11 | Every patient contact is used as an opportunity to check vaccination status and for recall | 21 | 47 | 6 | 4 | 78 | 8 | 18 | 7 | 45 | 78 |
| D01 | Practice facilities are accessible for wheelchairs—in case the practice is not located in the ground floor there is an elevator | 39 | 12 | 4 | 11 | 66 | 19 | 9 | 4 | 34 | 66 |
| D02 | Every member of the team has taken part in at least one job-related CME training event in the past 12 months | 38 | 14 | 2 | 7 | 61 | 12 | 21 | 4 | 24 | 61 |
| D03 | Physicians of the practice take part in accredited quality circles | 25 | 8 | 5 | 10 | 48 | 10 | 9 | 5 | 24 | 48 |
| E02 | Every medical record contains an overview about the patients' current medication | 11 | 50 | 9 | 6 | 76 | 6 | 11 | 7 | 52 | 76 |
| E03 | Every medical record contains information about the patients' intolerances and contraindications to medication | 16 | 41 | 12 | 7 | 76 | 6 | 10 | 5 | 55 | 76 |
| E06 | All medical equipment and devices are checked according to legal requirements periodically | 45 | 7 | 9 | 6 | 67 | 12 | 23 | 10 | 22 | 67 |
| E07 | For every member of the practice team there is documentation of at least one practical training in resuscitation and management of acute emergencies in the past 12 months | 43 | 8 | 4 | 8 | 65 | 9 | 21 | 7 | 26 | 63 |

Conclusive associations between the individual criteria of feasibility concerning every single QI and the tested variables such as country, urbanisation of practice location, hospital affiliation, way of record keeping, use of EDP, practice utilisation, paediatricians' age, gender and years of experience were not found and could not be expected due to the study design and the study's low power.

## Discussion

In an international comparative study with 79 paediatric practices from eight European countries, we surveyed the feasibility of a comprehensive set of paediatric primary care indicators, the COSI-PPC-EU QI [12]. Since the term feasibility is not clearly defined in the literature, an operationalised criteria catalogue from previous studies for primary care practices was used and an online questionnaire to test these criteria was developed [5]. All in all, practices accepted most indicators as applicable, available, reliable, acceptable and relevant for monitoring quality of care in paediatric primary care. However, respondents rated feasibility and effort to retrieve the data lowest because of difficulties collecting the data from the patient records. Our findings confirm the fact that discussing and consenting clinical indicators is an easy task compared to the challenges of their application in the real world. Therefore, the British National Institutes for Health and Care Excellence (NICE) is right to place particular emphasis on the feasibility and effort of collecting the required data for their standards [1].

**Table 6** Free text comments from participants who responded to the free-text option, summarised and grouped

- Propose the *improvement of information technology* to support the automatic calculation of numerator and denominator for each of the quality indicator.
- Software should be programmed for *easier documentation* and *filter settings* to measure.
- Differences in *knowledge and communication skills* between professionals. Not all professionals register the items the same way. Most items of the electronic registers cannot be analysed.
- *Lack of time* as a major obstacle to fulfil this additional task.
- *Distribution of tasks and implementation of guidelines are different between the countries*; e.g. neonatal screening is an obstetric task and is beyond the scope of the paediatrician in France (Referring to QI A05: Number of patients, who received metabolic screening in hospital or at primary care provider)
- *Legal requirements are different between the countries*.

Barrier free access is mandatory in France. (Referring to QI D01: Practice facilities are accessible for wheelchairs—in case the practice is not located in the ground floor there is an elevator) Participating at Quality Circles/Peer review is mandatory in PPC for statutory insured patients in Germany. (Referring to QI D03: Physicians of the practice take part in accredited quality circles)

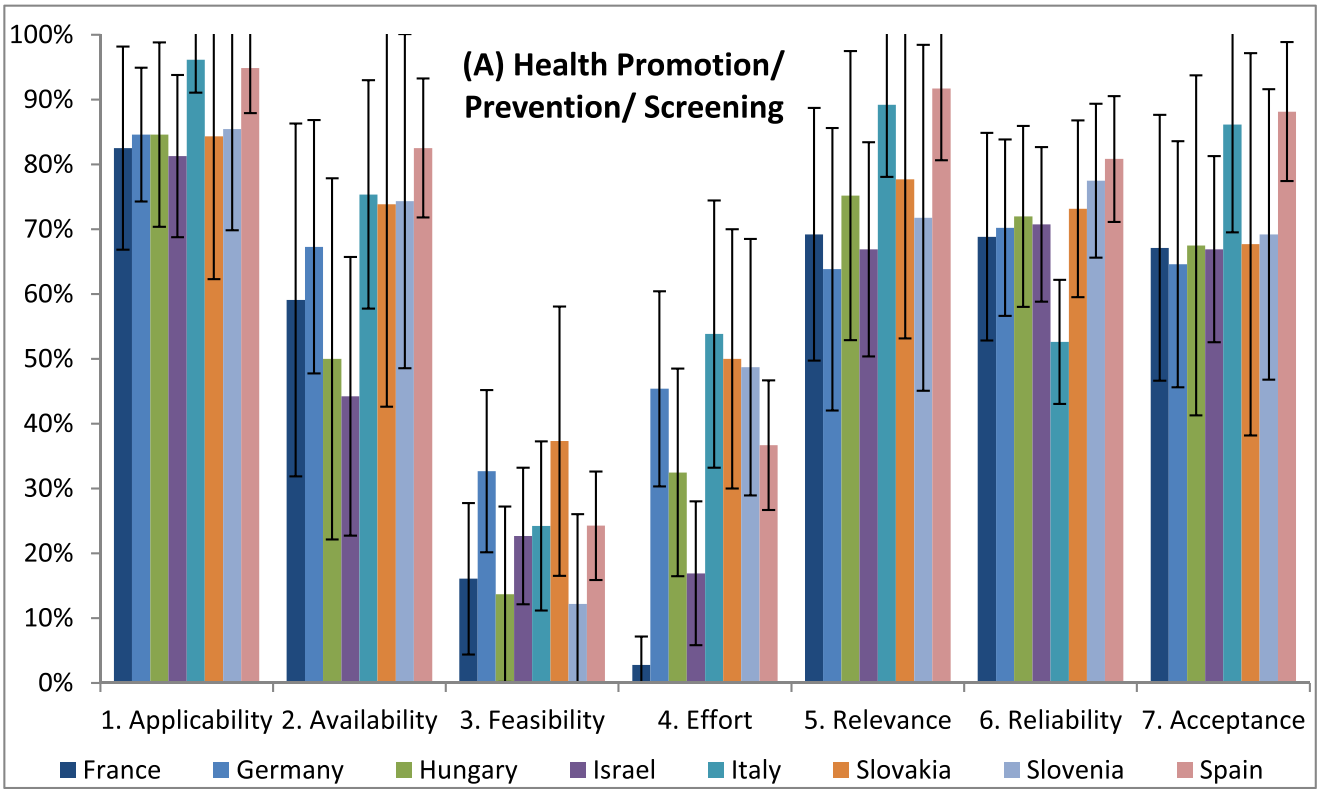


**Fig. 2** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of the COSI-PPC-EU focussing (A) Health Promotion/Prevention/Screening; the mean and the standard deviation (SD) are indicated

Most of the participating paediatricians considered the COSI-PPC-EU QI for their practice settings as applicable, relevant, reliable and acceptable. Acceptance is a basic element of feasibility [2]. Based on the literature, many of these terms are synonymous with validity and were developed in the previous assessment completed during the RAM development process and now confirm the previous expert group's assessment in practice [12]. Availability is another important aspect of feasibility. It serves as a basic screening tool to decide whether the implementation of a particular indicator in the institution is actually possible [5]. The participating paediatricians answered very differently. This is reflected in the results for the individual QI categories as well as for the participating countries. The data documentation in the individual countries, as the free-text answers describe it, is very different due to legal regulations, technical and traditional approaches. At least for the purely medical indicators in categories *(A)* to *(C)*, this was not expected. These indicators were derived from international guidelines and existing standards. Whether this can be an indication that the guidelines are not implemented in the practices remains speculation. It seems to be related to the structure of the EMR databases. EMR collect statutory records and specific data for billing purposes, they have not been programmed for the assessment of medical guideline implementation. And it might be very human to document only what is required to document. Nevertheless, the primary source for measurement of quality in health care is the patient record. The results show that the data needed, if available, can only be extracted from routine patient records to a certain point. To retrieve all data from the documentation, the technical feasibility was estimated low and the time effort less reasonable in a day-to-day practice routine. This limits the data collection and calculation of the QI considerably. Earlier surveys from practices already suggested that data collection is limited because of technical obstacles and because of high time consumption [5, 15].

If one compares the attempts to collect QI data in the outpatient setting with the inpatient setting, one notices that even here data cannot simply be collected from routine data sets. Using specially developed software tools, the operationalised QI data sets must be collected, entered and calculated. Usually this can only be done by trained personnel [3, 9, 23–25]. Other attempts to apply QI in the practices show that this is just as necessary in the outpatient setting [15]. However, if the collection of data by the practice staff is too time-consuming and well-trained staff is absent in practice or too costly from outside the practice, data collection must be automated. Participants of this study indicate in the free text answers that this is possible. Meanwhile, at the political level in Europe, it is required to introduce measures for quality assurance, quality measurement and benchmarking in the

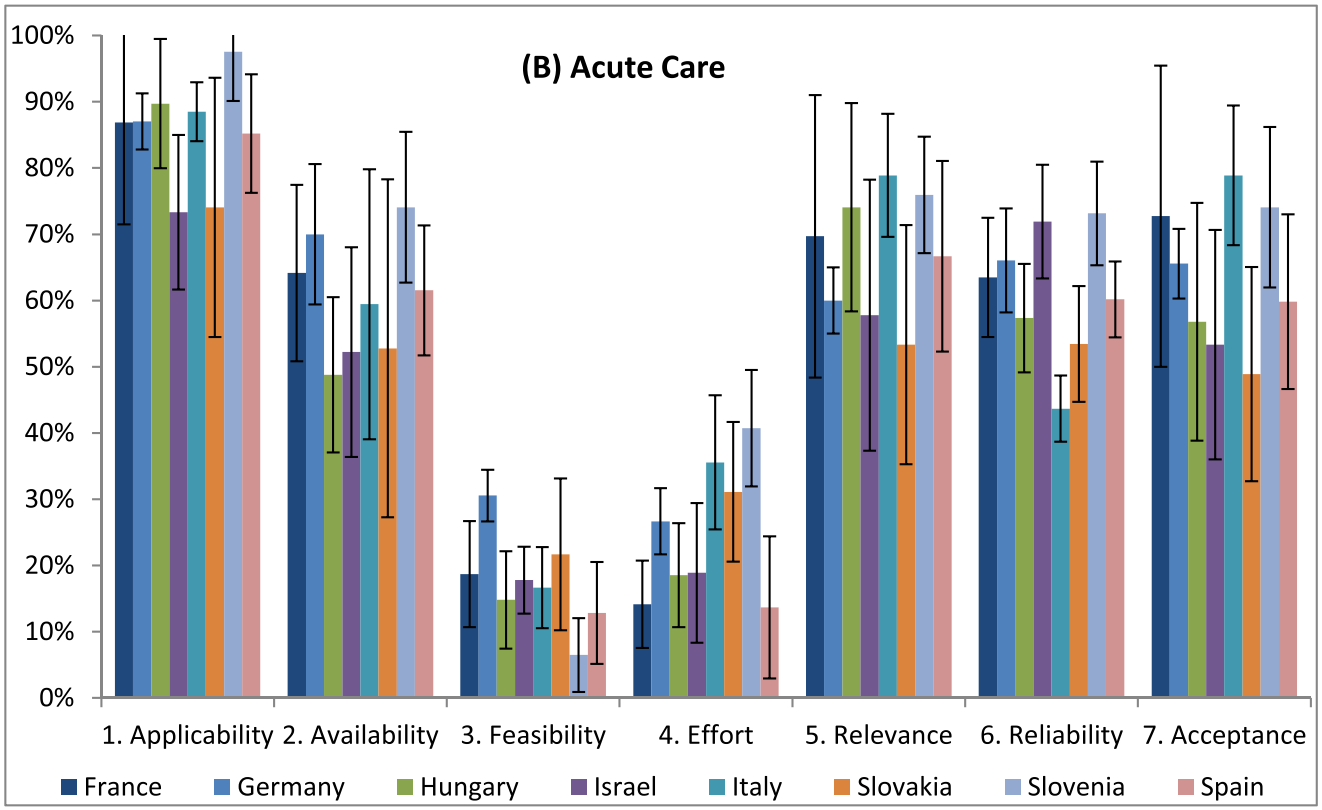


**Fig. 3** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of the COSI-PPC-EU focussing (B) Acute Care; the mean and the standard deviation (SD) are indicated

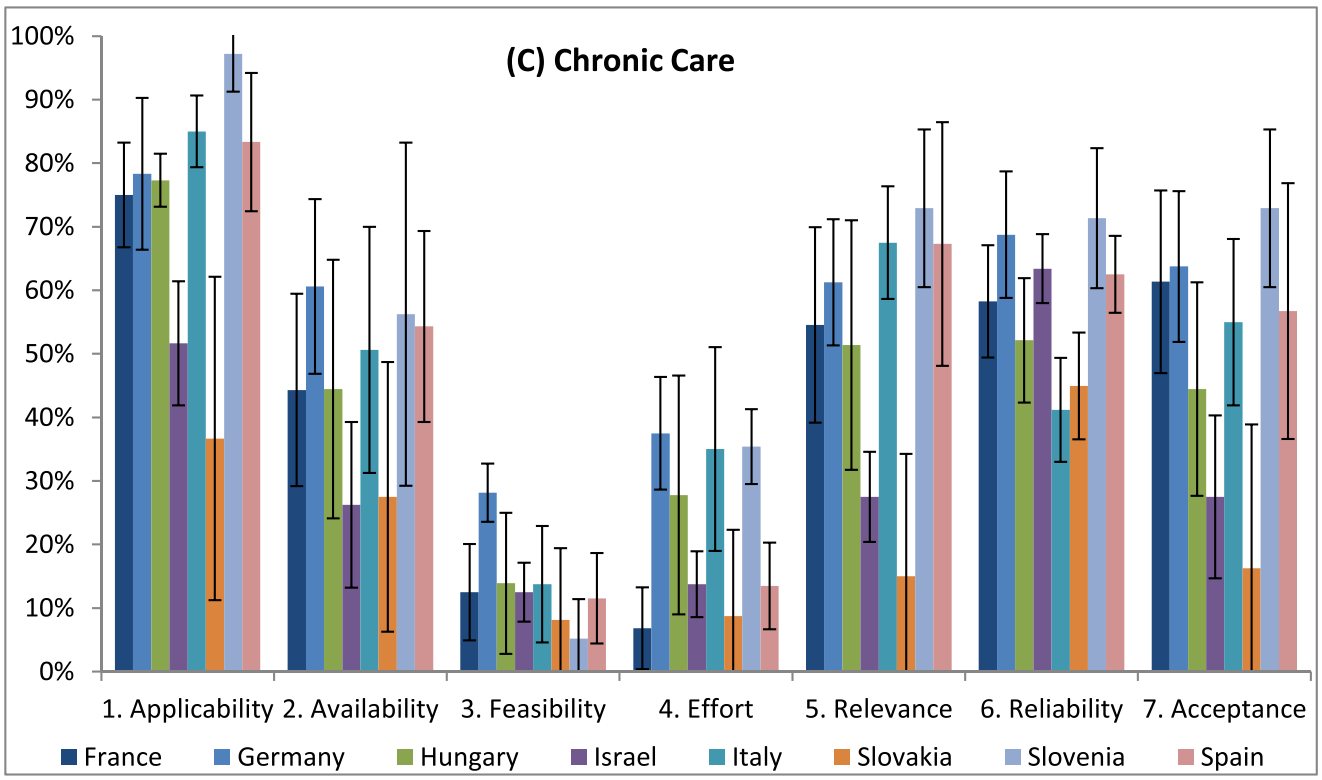


**Fig. 4** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of the COSI-PPC-EU focussing (C) Chronic Care; the mean and the standard deviation (SD) are indicated

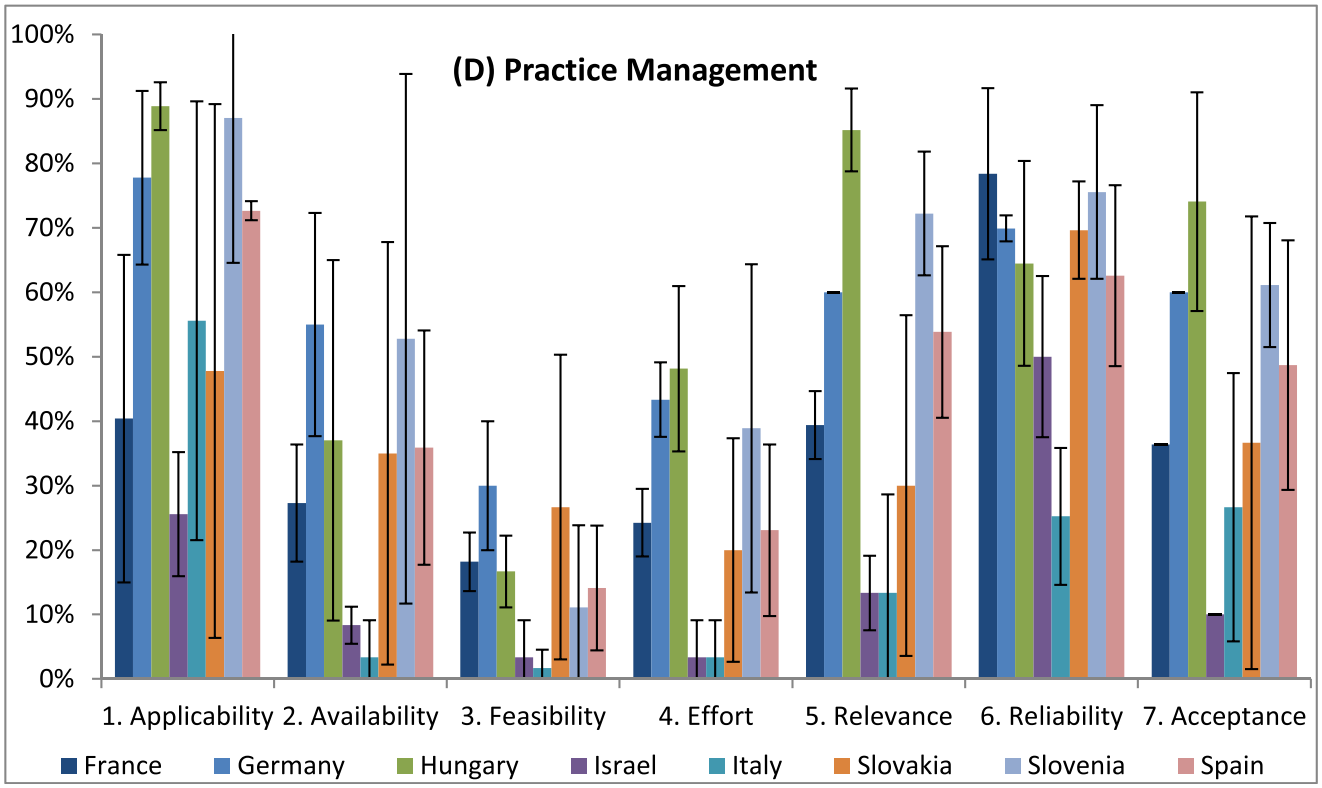


**Fig. 5** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of the COSI-PPC-EU focussing (D) Practice Management; the mean and the standard deviation (SD) are indicated

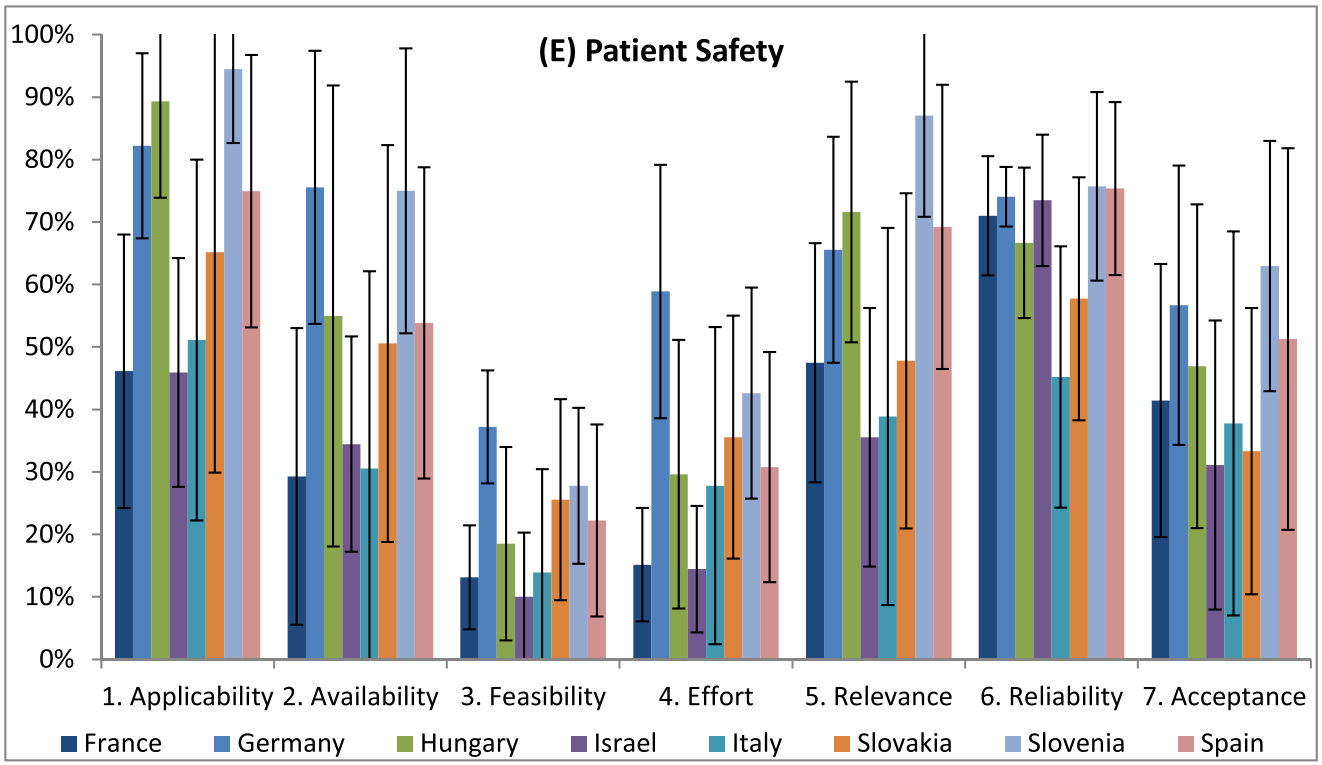


**Fig. 6** European paediatric primary care practices' ratings of applicability, availability, feasibility, effort, relevance, reliability and acceptance of the COSI-PPC-EU focussing Patient Safety; the mean and the standard deviation (SD) are indicated

practices [11]. However, this requires much more involvement and investment by stakeholders in the development and certification of quality-oriented EMR [5].

Concerning QI of practice management and patient safety, the different legal regulations in the participating countries seem to play an even greater role. For example, the introduction of a quality management (QM) system for outpatient medical practices is mandatory since 2005 in Germany. As early as 2010, 92% of children's and adolescent medical practices reported that they had implemented a QM system [6]. The availability of the data required for the COSI-PPC-EU is correspondingly high; albeit with significant potential for improvement, see Figs. 5 and 6. In countries where the introduction of QM system is voluntarily, such as France and Italy, availability was assessed lowest—even though Italy is the country with the highest number of quality certificates awarded worldwide [18].

## Limitations of the study

One of the objectives of the study was to represent a range of multiple possible organisational and structural practice characteristic in each country. The recruitment of ten paediatricians in each country however could not be achieved. Eight countries finally had to be excluded and two countries did not reach the recommended number of ten completed questionnaires, but just six (Slovenia), respectively, nine (Hungary). This should be taken into account when assessing the study and interpreting the available data. Depending on the national health care system and its organisation of PPC, physicians could be more familiar with QI or already use automated data collecting software. That is reflected also by the different free text answers from the participating countries.

An additional possible selection bias in this voluntary survey could emerge from an unintended selection of voluntary respondents with English proficiency and earlier exposure to the quality debate. The study design accepted the fact that the limited recruitment and composition of the sample could influence the results in both directions. The study was designed from the beginning as a descriptive exploratory survey.

## Conclusion

A selected group of European PPC paediatricians accepted COSI-PPC-EU as valid for the paediatric practice. COSI-PPC-EU is closely related to the PPC-provider setting. The major part of the data for the QI seems to be available in Europe but it is stored and hidden in a variety of software applications. The time effort and the user friendliness to retrieve the data from EMR make the set less feasible. This limitation calls for technical solutions by information technology specialists and a backup by legal regulations—ideally integrated into a European health programme for children and adolescents, e.g. like the Models of Child Health Appraised (MOCHA) Project—www.childhealthservicemodels.eu—a Horizon 2020 Research Project of 30 European countries.

COSI-PPC-EU could then serve as an additional tool to enable the involved parties to measure, assess, monitor and compare units of service and regions within or between European countries. Benchmarking, with the goal to raise European standards and awareness, would be possible.

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**Authors' contributions** Dominik A. Ewald acted as European study coordinator and drafted the manuscript. Gottfried Huss acted as project initiator and European study coordinator. Rike Antje Kraska programmed the questionnaire and performed the statistical analyses. Max Geraedts was the principle scientific study coordinator who coordinated the development of the questionnaire, the data processing and analyses.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interests.

**Informed consent** All authors revised the manuscript for important intellectual content and approved the final version before submission.



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