

# BMJ Open Quality Checklist to aid young physicians managing obstetric emergencies in rural India: a quality improvement initiative

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## ABSTRACT

**Background** The decision to admit or refer a patient presenting with an obstetric emergency is extremely crucial. In rural India, such decisions are usually made by young physicians who are less experienced and often miss relevant data points required for appropriate decision making. In our setting, before the quality improvement (QI) initiative, this information was recorded on loose blank sheets (first information sheets (FIS)) where an initial clinical history, physical examination and investigations were recorded. The mean FIS completeness, at baseline, was 73.95% (1–5 January 2020) with none of the FIS being fully complete. Our objective was to increase the FIS completeness to >90% and to increase the number of FIS that were fully complete over a 9-month period.

**Methods** With the help of a prioritisation matrix, the QI team decided to tackle the problem of incomplete FIS. The team then used fishbone analysis and identified that the main causes of incomplete FIS were that the interns did not know what to document and would often forget some data points. Change ideas to improve FIS completeness were implemented using Plan-Do-Study-Act (PDSA) cycles, and ultimately, a checklist (referred to as antenatal care (ANC) checklist) was implemented. The study was divided into six phases, and after every phase, a few FIS were conveniently sampled for completeness.

**Results** FIS completeness improved to 86.34% ( $p<0.001$ ) in the post implementation phase (1 Feb to 31 August 2020), and in this phase, 69.72% of the FIS were documented using the ANC checklist. The data points that saw the maximum improvement were relating to the physical examination.

**Conclusion** The use of ANC checklist increased FIS completeness. Interns with no prior clinical and QI experience can effectively lead and participate in QI initiatives. The ANC checklist is a scalable concept across similar healthcare settings in rural India.

## BACKGROUND INFORMATION (INTRODUCTION)

Proper documentation of clinical notes is vital to clinical case management. Documentation reflects a physical translation of history and examination done by an examining healthcare professional on to the case records. Good and complete clinical records protect the physician against legal ramifications and also improve the quality of patient care as inconsistent and incomplete clinical notes have been inextricably linked to patient

harm.<sup>1–3</sup> Despite an awareness of the importance of documentation, many studies have shown that incomplete clinical notes are a persistent problem.<sup>4</sup>

At our hospital, patients presenting to the obstetric emergency are managed by interns, who are Bachelor of Medicine and Bachelor of Surgery (MBBS) graduates doing their 1-year Compulsory Rotatory Residential Internship (CRRI) and are currently posted at the Centre for Community Medicine (equivalent to Department of Public Health). The interns manage the cases under the direct supervision of a junior resident physician in the department of obstetrics and gynaecology. The obstetric emergency is the first point of contact between the patient and the intern, and it is at this point that the intern notes the relevant clinical history, physical examination, and investigations on first information sheets (FIS). Since our hospital does not have emergency caesarean section facilities, complicated cases such as severe pre-eclampsia, patients with previous caesarean sections and severe anaemia are referred to higher centres equipped with facilities to provide the above services. The decision to admit/refer the patient is crucial at this juncture. These FIS play a crucial role in deciding the further management of the patient, and there were instances in which, due to some omissions, patients who should have been referred were admitted instead.

The interns formed a quality improvement (QI) team along with a junior resident physician and a nursing officer to tackle the above problem. The QI team had no prior clinical or QI experience; however, the first author (an intern) had been trained in using QI methods by point-of-care quality intervention (POCQI) and the QI open course developed by the Institute for Healthcare Improvement.<sup>5,6</sup>

At baseline, (before the QI) our mean FIS completeness was 73.95%, and our objective was to increase the FIS completeness to

>90% and sustain it for 9 months. We describe our QI project using the Standards for Quality Improvement Reporting Excellence (SQUIRE) V.2.0 framework.<sup>7</sup>

## METHODS

### Study setting

Our hospital, Sub-District Hospital (SDH) Ballabgarh, is operated by the Centre for Community Medicine (equivalent to Department of Public Health) under its Comprehensive Rural Health Services Project<sup>8</sup> 1961 at the All India Institute of Medical Sciences (AIIMS), New Delhi. It is a secondary care hospital with routine out-patient and in-patient services in the departments of internal medicine, obstetrics and gynaecology, paediatrics, ophthalmology and surgery. The hospital conducts around 400 normal vaginal deliveries every month. The hospital also has an operating theatre and provides routine elective surgery facilities; however, due to the lack of an in-house blood bank, emergency surgeries, including emergency caesarean sections, cannot be performed. Since SDH Ballabgarh is associated with a teaching medical college (AIIMS, New Delhi), students who have just cleared their final professional MBBS examination, interns, are posted here for 6 weeks as a part of their 1-year CRRI. As a part of their clinical duties, interns have to manage obstetric emergencies and conduct normal vaginal deliveries in the hospital under the supervision of a junior resident physician in the department of obstetrics and gynaecology.

### Prioritisation matrix and fishbone analysis

On 1 January 2020, VP, an intern, sensitised his fellow interns on the QI methodology, and a small team of three interns started collecting data on multiple processes to decide which problem to solve. Whenever team members could get time off their duties or during their routine postings in the obstetric emergency, we would record axillary temperatures of all admitted neonates; we also observed multiple deliveries to see if the practice of delayed cord clamping was followed and if the neonates and the mothers were administered vitamin K and uterotonic injections, respectively. We also audited a few FIS to check for completeness. Following this exercise, the team developed a prioritisation matrix (table 1).

Due to ease of measurement, affordability in terms of time and resources and the process being completely

under the control of the QI team, the team decided to solve the problem of incomplete FIS at the time of admission into the labour room for delivery. Using fishbone analysis, the team identified that the main causes of incomplete FIS were that the interns were not aware of what to document and would often forget some data points (online supplemental file 1).

### Planning the intervention

After deciding on which problem to solve, the interns asked a junior resident physician in the department of obstetrics and gynaecology and a nursing officer to join the QI team. Based on an understanding of the main causes of incomplete FIS, the QI team developed three interventions, which were tested using successive PDSA cycles.

#### PDSA cycle 1: Education/orientation session of interns (5–10 January 2020)

On 5 January 2020, the junior resident physician from the department of obstetrics and gynaecology conducted an education/orientation session of interns detailing how to take relevant history and perform a physical examination. Interns were also explained the significance of each data point and the relevant clinical criteria for admission and referral of patients presenting with obstetric emergencies. However, the session was attended by only 6 of the 13 interns posted at SDH Ballabgarh, and just after 2–3 days, the interns in the QI team still could not satisfactorily remember all the data points necessary for clinical decision making. Also, the mean FIS completeness dropped to 67.46% after PDSA cycle 1.

#### PDSA cycle 2: Sticking the notes of the education session on the wall (11–15 January 2020)

A few days later, based on the learnings of the education/orientation session, the QI team neatly wrote all the necessary data points that interns were required to document in the FIS on a blank sheet of paper and stuck that paper on a wall, which was adjacent to the location where patients with obstetric emergencies presented. This did help the interns in remembering the necessary data points, and the mean FIS completeness did increase to 72.45% but was still lower than the baseline. It was also noticed that the notes that were stuck on the wall were incomplete (did not contain all the necessary data

**Table 1** Prioritisation matrix for multiple possible processes for intervention

| Possible aim                            | Prevalence of the problem | Importance to patient outcome | Affordable | Easy to measure | Under control of team members | Total score |
|---|---------------------------|-------------------------------|------------|-----------------|-------------------------------|-------------|
| Delayed cord clamping                   | 4                         | 5                             | 4          | 4               | 2                             | 19          |
| Neonatal hypothermia                    | 3                         | 4                             | 4          | 4               | 1                             | 16          |
| Vitamin K and uterotonic administration | 1                         | 4                             | 5          | 3               | 2                             | 17          |
| <b>FIS incompleteness</b>               | <b>5</b>                  | <b>3</b>                      | <b>4</b>   | <b>5</b>        | <b>4</b>                      | <b>21</b>   |

FIS, first information sheets.

points) and were also subject to the location, as if the interns had to complete FIS at any other place they still faced similar problems as before. This intervention did not solve the problem of inconsistent FIS, interns were writing different data points in different locations and the nursing officers had to spend a large amount of time scanning notes to find the relevant information that they wanted. The need was felt for a better aid for FIS documentation.

### PDSA cycle 3: Antenatal care (ANC) checklist (16–20 January 2020)

The ANC checklist was born out of the success of the PDSA cycle 2 (sticking notes to the wall). As our ward was equipped with a functioning desktop and a printer, we decided to design a checklist that could be printed before the start of every shift by interns or nursing officers. The QI team deliberated extensively on each data point that was to be included in the ANC checklist. For instance, the relevant necessary investigations that needed to be documented were based on existing hospital policies and congruent with the Ministry of Health and Family Welfare (MoHFW), Government of India's (GOI) guidelines. The data point of high-risk pregnancy (HRP) was identified as important in deciding whether the patient needs to be admitted or referred; hence, a designated area was assigned in the ANC checklist to document the cause of high risk if the pregnancy was indeed a high-risk one. A few preliminary designs were developed and tested in a 1-1-1 format (one intern-one shift-one patient). Feedback from fellow interns and members of the QI team helped us refine the ANC checklist design, and ultimately, the

following design (figure 1) was decided on. A preliminary iteration of the ANC checklist that was later modified into its present form can be found in the online supplemental file 2. The key to the final design was the inclusion of a large amount of negative space to offer freedom to the treating interns. After the ANC checklist was introduced, the mean FIS completeness increased to 77.04%. Following the positive results, the final design was presented to the faculty in charge (RK) of SDH Ballabgarh, and after his approval, the ANC checklist was implemented.

### Checklist implementation

Once the ANC checklist was implemented, interns and nursing officers were trained and introduced to the ANC checklist individually on a shift-wise basis. In this phase, mean FIS completeness increased to 81.97%. After the 'checklist implementation' phase, the nursing officers took the responsibility of printing the ANC checklist and ensuring that the interns that are posted in the future completely fill the ANC checklist.

### Evaluation of the intervention

The QI team decided on 31 data points to be documented in the FIS. Out of these 31 data points, 25 were classified as 'must be present' and six as 'should be present'. Out of these 31 data points, three were 'special case points' applicable only in certain scenarios (HRP, nature of the amniotic fluid/liquor (could only be assessed if the fetal membranes were ruptured) and period of gestation at the time of ultrasonography if the date of the last menstrual period was unknown to the mother). Every individual

**(A) Front end of the checklist:**

- HOSPITAL NAME REMOVED (Hospital Logo Removed)
- Date: / / Time: : : Name: W/O: /F: EMERGENCY NO.:
- AM/PM: **G P L A**
- LMP: POG: EDD: (DATE)
- EDD BY USG (DATE) (if applicable use earliest available date)
- POG BY USG (DATE)
- USG ( / / ) POG: SINGLE  TWIN
- PRESENTATION: PLACENTA: LIQUOR:
- INVESTIGATIONS: BLOOD GROUP: POS/NEG: HB ( / / ): VIRAL MARKERS (Hep B, Hep B surface, HIV, VDRL)
- COMPLAINTS: LABOUR PAIN , LEAKING PV , SHOW , DISCHARGE PV , BLEEDING PV , FETAL MOVEMENT
- Other investigations: Other complaints: DURATION: Doctor's Signature:

**(B) Back end of the checklist:**

- HOSPITAL NAME REMOVED (Hospital Logo Removed)
- ON EXAMINATION: GENERAL CONDITION: BP: Pulse: VITALS:
- P/A: Fundal Height: Presentation: Contractions: FHR:
- P/V: Duration: : Effacement: : Station: Membranes: Present  Absent  Liquor: Clear  Meconium stained  Blood stained  NA
- ADVICE: ADMIT TO LABOUR ROOM , KEEP FOR OBSERVATION , NO TREATMENT NEEDED , REFER TO HIGHER CENTRE , REASON FOR REFERRAL (if applicable): Doctor's Signature:

**Figure 1** The antenatal care admission checklist. The front end of the checklist (A) contains information about demographic details, obstetric history along with the expected date of delivery, ultrasound investigations (along with dates), blood investigations (Haemoglobin and viral markers) and the presenting complaints. The back end (B) contains information relating to physical examination, the doctor's advice and the final decision to be made. The checklist was printed at the start of every shift by the nursing officer or intern on duty. (Abbreviations: W/O, wife of; HRP high-risk pregnancy; G, gravida; P, parity; L, living children; A, abortions; LMP, last menstrual period; POG, period of gestation; EDD, estimated date of delivery; USG, Ultrasonography, Hb, hemoglobin; VDRL, Venereal Disease Research Laboratory test for Syphilis; P/A, per abdomen; PV, per vagina; BP, blood pressure)

**Table 2** Different phases of the quality improvement intervention along with their dates and the number of first information sheets (FIS) audited, respectively

| S no. | Phase of the study           | Dates (2020)    | FIS audited (n) |
|-------|------------------------------|-----------------|-----------------|
| 1     | Baseline                     | 1–5 Jan         | 12              |
| 2     | PDSA cycle 1                 | 5–10 Jan        | 5               |
| 3     | PDSA cycle 2                 | 11–15 Jan       | 14              |
| 4     | PDSA cycle 3 (ANC checklist) | 16–20 Jan       | 10              |
| 5     | Checklist implementation     | 21–31 Jan       | 39              |
| 6     | Checklist sustainability     | 1 Feb to 31 Aug | 65              |

n stands for the number of files audited.  
ANC, antenatal care.

FIS was given a score out of a range of 28–31 based on the number of data points that were applicable for that patient. If a data point was present, it was scored as one else zero, and that score was calculated as a percentage (FIS completeness).

In addition to FIS completeness, we also measured how many FIS (out of the total in each phase) had the individual data points present (data point completeness). All these data points along with their completeness are mentioned in the online supplemental file 3. VP along with two trained colleagues who were blinded to patients and treating interns scored the FIS. For quality assurance, 10% of the audited files were rechecked by the nodal officer of QI. We divided our study into six phases (table 2).

During baseline, at least two FIS were audited every day followed by at least five FIS at every 5-day intervals in the first month of the QI project (1–31 January 2020) and at least five FIS at every 15-day intervals during the 8 months of the ‘checklist sustainability’ phase. The FIS were conveniently sampled. As the obstetric emergency department was operational for 24 hours and 7 days of the week and patients did not present based on any set working hours or days and interns managed the patients during the weekends as well, we did not exclude/include patients that presented during the weekends in our sampling approach.

## Process measures

### QI objectives

1. FIS completeness—All FIS were given a score out of 28–31 (based on the number of data points that were applicable for that patient), and this score was calculated as a percentage:
  - a. Numerator—Number of data points that were present (scored as one per data point if the data point was present).
  - b. Denominator—Total number of applicable data points (28–31).
2. Completely filled FIS—An FIS was defined as ‘complete’ if it had all 25 of the ‘must be present’ data

points and three of the six ‘should be present’ data points:

- a. Numerator—Number of files that fulfilled the above criteria.
- b. Denominator—Total number of files audited in that phase of the study.

### Other process measure

1. Percentage of FIS that used the ANC checklist:
  - a. Numerator—Total number of FIS that used the ANC checklist after the ‘checklist PDSA’ phase (21 January to 31 August).
  - b. Denominator—Total number of FIS audited.

### Data analysis

A run chart of FIS completeness was used to measure progress over time. Using the Shapiro-Wilk test, the FIS completeness curve was found out to be not normally distributed, and the Wilcoxon rank-sum (Mann-Whitney) test was performed on mean FIS completeness during different phases of the QI project and on mean FIS completeness with and without the use of the ANC checklist. For data point completeness in different phases of the study, the ‘Mann-Whitney U’ test for different proportions for non-parametric data was performed. P value <0.05 was used as criteria for statistical significance. Data analysis was performed using Stata, (StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC) run chart, and graphs were prepared using Microsoft Excel.

## RESULTS

### Process measures

#### QI objectives

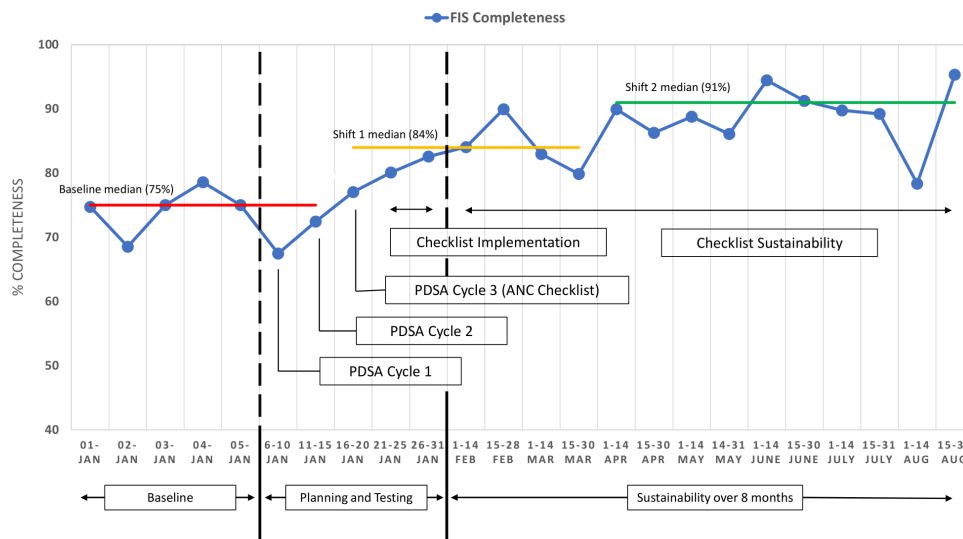
The mean FIS completeness was 86.34% during the ‘checklist sustainability’ phase and 81.97% during the ‘checklist implementation’ phase, a significant increase from the baseline of 73.95% ( $p<0.001$  and  $p=0.0017$ , respectively). Figure 2 represents the run chart of this metric at every 1-day interval during the baseline, every 5-day intervals for the first 1 month and every 15-day intervals for the next 8 months. The individual data points that had the maximum positive change are mentioned in table 3. The data point of HRP, crucial in deciding whether to admit or refer a patient, saw an increase from none of the FIS containing the information (0%) to 17/30 (56.66%) FIS containing the data point in the ‘checklist sustainability’ phase.

All the 31 data points (‘must be’, ‘should be’ and ‘special case’) and the changes observed in these fields in each phase of the QI project are mentioned in the online supplemental file 3. The proportion of complete FIS also increased from 8.33% (1/12) during baseline to 24.62% (16/65) although the difference was not statistically significant ( $p=0.2$ ).

### Other process measure

During the ‘checklist implementation’ and ‘checklist sustainability’ phases, the ANC checklist was used in

### RUN CHART OF FIS COMPLETENESS OVER TIME



**Figure 2** The outcome measure of first information sheets (FIS) completeness is depicted here over a run chart. The various phases of the study are labelled accordingly. The X-axis denotes the timeline: 1-day intervals during the baseline (1–5 January), 5-day intervals during the PDSA and the “checklist implementation” phase (6– 31 Jan) and 15-day intervals in the “checklist sustainability” phase (1 Feb to 31 August) as demarcated by the black dashed lines. The Y-axis denotes the percentage of FIS completeness. The blue line denotes the change in the completeness of FIS over time, the red line denotes the baseline median (75%), the yellow line denotes the new median (84%) after the first shift and the green line denotes the new median (91%) after the second shift. A shift is defined by an occurrence of six consecutive data points above or below the current median. ANC, antenatal care.

69.72% of FIS (76/109). In the above two phases, mean FIS completeness with the ANC checklist (87.74%) was significantly better than mean FIS completeness without the ANC checklist (74.42%) ( $p < 0.001$ ).

## DISCUSSION

### Statement of principal findings

Checklists have been adopted in multiple clinical settings to improve the quality of care and patient outcomes.<sup>9</sup> The implementation of our ANC checklist did lead to a significant increase in FIS completeness, and the improvement was sustained over 9 months. In April 2020, due to the SARS-CoV-2 pandemic, in-person education/orientation sessions could not be conducted for the incoming batches of interns. Our ANC checklist came in very useful in this

scenario, and FIS completeness did not fall even in these tumultuous times. The individual data points that saw the maximum improvement in completeness were the points relating to physical examination. The data point of HRP (such as severe anaemia (Hb <7gm/dL), previous caesarean sections and severe pre-eclampsia) if applicable, a clinically relevant data point due to its crucial role in deciding whether to admit or refer the patient, also increased significantly from none of the files containing the data point to 17/30 FIS (56.66%) containing the data point during the ‘checklist sustainability’ phase. There was no significant change in the documentation rates of demographic details, laboratory investigations, doctor’s advice and doctor’s signatures.

**Table 3** Total completeness of individual data points in different phases of the quality improvement study

| Data point                      | Baseline (n=12) | PDSA cycle 1 (n=5) | PDSA cycle 2 (n=14) | Checklist PDSA (n=10) | Checklist implementation (n=39) | Checklist sustainability (n=65) | Change from baseline |
|---------------------------------|-----------------|--------------------|---------------------|-----------------------|---------------------------------|---------------------------------|----------------------|
| Fundal height P/A               | 50% (6)         | 20% (1)            | 35.71% (5)          | 80% (8)               | 79.48% (31)                     | <b>92.30% (60)*</b>             | 42.3%                |
| Contractions P/A                | 25% (3)         | NIL                | NIL                 | 60% (6)               | 58.97% (23)                     | <b>95.39% (62)*</b>             | 70.39%               |
| Cervical effacement P/V         | 66.67% (8)      | 60% (3)            | 78.57% (11)         | 80% (8)               | 74.36% (29)                     | 87.69% (57)                     | 21.02%               |
| Presence of fetal membranes P/V | 25% (3)         | 20% (1)            | 14.28% (2)          | 60% (6)               | 48.72% (19)                     | <b>93.84% (61)*</b>             | 68.84%               |
| HRP if applicable               | 0% (0/3)        | 0% (0/2)           | 40% (2/5)           | 25% (1/4)             | 25% (2/8)                       | <b>56.66% (17/30)*</b>          | 56.66%               |

\*Denotes statistically significant change ( $p < 0.05$ ).

HRP, high-risk pregnancy; P/A, per abdomen; P/V, per vagina.



### Interpretation within the context of the wider literature

A study by Mahmoud *et al* concluded that the completeness of patient's notes related to physical examination was low in the obstetrics and gynaecology department of their hospital,<sup>10</sup> and another study by Vahedi *et al* showed that an intervention aimed at increasing completeness of clinical notes lead to an increase in the accuracy and rates of documentation of physical examination<sup>11</sup>; both the above findings were corroborated by our study.

The MoHFW (GOI) issues guidelines for whether to admit or refer a patient suffering from complications during labour such as postpartum Haemorrhage.<sup>12</sup> However, there are no validated tools for evaluating clinical decision making in real-time clinical practise<sup>13</sup> on whether to admit or refer a patient, which is one of the most important decisions to be made in a resource-limited setting such as ours. Our ANC checklist aids inexperienced clinicians in making such crucial decisions. It also provides them with a transparent way to communicate their decision to the patient, her caretakers and the receiving physician at the higher centre.

Many studies aimed at improving the completeness of clinical records have been performed, but most of them have used only an educational intervention. A study in Ethiopia reported a significant increase of completeness from 73% to 84%,<sup>14</sup> and many other studies have reported modest but significant differences using a similar methodology.<sup>11 15 16</sup> Most of these studies concluded that educational interventions are effective only if the interventions are made periodically, and its effects usually taper off with time,<sup>17 18</sup> something that the team noted very early in the QI journey, and since education/orientation sessions could not be conducted multiple times, we decided to go ahead with our ANC checklist.

### Implications for policy, practice and research

Following the success of our ANC checklist, it was subsequently adopted at the primary health centres (publicly funded hospitals in rural India that provide primary outpatient and emergency care including normal vaginal deliveries) operated by the Centre for Community Medicine, AIIMS, New Delhi. Many rural health systems including ours have an ANC registration card given to the registered mothers, which includes all the information related to their pregnancy from the first trimester onwards; our ANC checklist serves as an important supplement to the above document, which focuses towards the last few weeks of pregnancy (36–40 weeks). In other rural healthcare settings in low-income and middle-income countries that are mostly operated by young physicians with less experience and where timely referral is key to receiving proper healthcare, our ANC checklist should prove to be useful.

### Strengths and limitations

Prior to the implementation of the ANC checklist, the interns used to document different data points in a blank paper having to remember every data point, and the

nursing staff had to scan the entire document in order to find the relevant information that they needed. The introduction of the ANC checklist lead to a decrease in the cognitive burden on both the interns and the nursing officers as the interns no longer had to remember all the data points to be documented and the nursing officers could easily refer to the designated section in the ANC checklist to review the required information. The reduced cognitive burden helped in increasing the acceptability of our intervention as previous studies had shown that an increased workload and duplication of data are key concerns of healthcare professionals regarding new interventions.<sup>19</sup> Even though the study shows that introduction of the ANC checklist led to an increased detection and documentation of high-risk pregnancies, the study cannot conclude whether the subsequent treatment that the patients received or the interns' decision to admit/refer the patient was correct as the study does not measure if the FIS were filled accurately; it only measures whether the information was filled or not. Another limitation of this study is that it does not establish a direct association between FIS completeness and patient outcome improvements such as rates of inappropriate referral or admission. The intervention does not aim at improving the clinical skills of the interns that it is aimed at.

### CONCLUSION

The use of the ANC checklist increased FIS completeness, and the improvement was sustained over 9 months. Interns with no prior clinical or QI experience can effectively lead and participate in QI initiatives. The ANC checklist is a scalable concept across similar low-resource rural settings.

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**Contributors** VP led the quality improvement initiative. VP, AKS, RK and KY contributed to designing the study, implementing the ideas and sustaining the initiative for 9 months. VP and two other trained colleagues audited the first information sheets. VP performed the statistical analysis. All authors revised the manuscript and reviewed and approved the manuscript in its final form.

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