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Assessment of Surgical Safety Checklist Compliance and Fidelity in Obstetrics and Gynecologic Surgeries: Insights from Northern Cameroon

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Abstract

Background: The World Health Organization's Surgical Safety Checklist (SSCL) is a proven tool to enhance surgical safety globally. However, its adoption and proper use remain inconsistent in low- and middle-income countries (LMICs), including Cameroon, where data on compliance and fidelity in obstetric and gynecologic surgeries are scarce. **Aim and Objectives:** This study aimed to assess the compliance (usage rate) and fidelity (completeness) of SSCL implementation in obstetric and gynecologic surgeries in northern Cameroon, identifying barriers to effective use through a behavioral framework. **Methods:** A prospective observational study was conducted across four hospitals in northern Cameroon. SSCL utilization during surgeries was documented, noting completion rates for each checklist section. Barriers to use were analyzed using the COM-B model (Capability, Opportunity, Motivation - Behavior), based on staff interviews and observational data. **Results:** Overall SSCL compliance was low at 38%. When used, sections 1 and 2 were completed in 100% of cases, but the sign-out section was omitted in 39%, resulting in only 61% overall checklist completeness. Barriers included limited staff training (capability), resource constraints and workflow pressures (opportunity), and low perceived value or leadership engagement (motivation).

Teaching hospitals demonstrated higher adherence rates. **Conclusion:** SSCL utilization in northern Cameroon remains suboptimal, particularly in checklist completion fidelity. Addressing gaps requires multifaceted interventions focused on enhancing training, optimizing surgical workflows, and fostering a safety-oriented culture. Applying behavioral frameworks like COM-B can guide targeted strategies to improve SSCL adoption and ultimately patient safety in resource-limited settings.

Keywords

Surgical Safety Checklist, Compliance, Fidelity, Obstetric and Gynecologic Surgeries, COM-B Model, Low- and Middle-Income Countries

1. Introduction

Surgery plays a vital role in public health, with its importance steadily increasing over the past century [1]. However, surgical procedures can pose significant risks, including adverse events (AEs) and even death, nearly half of which are considered preventable [1]. To mitigate these risks, the World Health Organization introduced the Surgical Safety Checklist (SSCL), which has been shown to reduce complications and improve patient outcomes [1]-[5].

Despite widespread adoption in high-income countries, SSCL implementation in low- and middle-income countries (LMICs) remains inconsistent [6], with reported usage rates ranging from 39.7% to 100% and generally low fidelity to checklist components [7]-[9]. Even when SSCLs are employed, completeness across the three checklist phases—sign-in, time-out, and sign-out—is often suboptimal and rarely exceeds 60% [9]. Implementation barriers in LMICs include insufficient training, high workload, and poor team coordination [9] [10]. Moreover, some studies suggest the SSCL primarily benefits those areas it specifically targets [11].

In Cameroon, available data on SSCL use are limited to major urban centers like Douala and Yaoundé, with little known about its application in rural or northern regions [12]. To address this gap, our study evaluated SSCL compliance (penetration) and adherence (fidelity) in obstetric and gynecologic surgeries in Northern Cameroon. We hypothesize that SSCL use remains low in Northern Cameroon, and where used, adherence is below the standard recommended guidelines. By identifying local barriers and performance gaps, our study aimed to support the development of strategies for nationwide implementation.

2. Methods

2.1. Study Design and Setting

This prospective observational study was conducted over six months in four hospitals located in Garoua, Northern Cameroon: Garoua Military Hospital (GMH),

Garoua Regional Hospital (GRH), Garoua General Hospital (GGH), and the Regional Hospital Centre (RHCG). These facilities were selected based on their involvement in surgical care and high patient turnover. GMH and GRH function as secondary-level referral hospitals, while GGH and RHCG serve as tertiary centers. All participating hospitals had functional obstetric and gynecologic units, operating theaters, and intensive care units. However, staffing was limited, with only one or two gynecologists/obstetricians per hospital and a shortage of theater nurses and support personnel.

Two of the hospitals (RHCG and GRH) had French-translated World Health Organization (WHO) Surgical Safety Checklists (SSCLs) and written surgical safety protocols available in the operating theaters. In tertiary centers, gynecological procedures were performed exclusively by specialists. In contrast, emergency cesarean sections in secondary-level hospitals were sometimes performed by general practitioners or surgeons in the absence of obstetricians. The SSCL was used only for procedures performed in the main operating theaters under regional or general anesthesia.

2.2. Sample Size Justification

This study did not use a formal power calculation, as it was exploratory in nature. The aim was to obtain a representative understanding of SSCL utilization and adherence patterns in the region. Therefore, a consecutive sampling approach was employed, including all eligible surgical cases observed during the study period. While not a pilot study per se, the findings are intended to guide future larger-scale studies and policy interventions.

2.3. Sampling and Observer Assignment

Consecutive sampling was used to include all eligible surgical cases during which a trained observer was present. To minimize selection bias and ensure temporal representativeness, trained senior medical students were scheduled to cover all surgical shifts—day and night, weekdays and weekends—via a structured duty roster. Emergency surgeries without observer presence were excluded from the analysis to maintain data consistency. The principal investigator conducted regular oversight through weekly site visits (3 - 4 days per week) and routine phone follow-ups with observers.

2.4. Inclusion and Exclusion Criteria

2.4.1. Inclusion Criteria

Women undergoing gynecological or obstetric surgeries during the study period with a designated observer present were included in the study.

2.4.2. Exclusion Criteria

We excluded emergency surgeries performed without observer presence.

A second study phase involved purposive sampling of surgical team members for interviews to identify barriers to SSCL compliance.

2.5. Operational Definitions

- **Penetration** (Compliance): The extent to which the SSCL was integrated into routine operating room procedures.
- **Fidelity** (Adherence): The degree to which all three components of the SSCL (sign-in, time-out, sign-out) were completed as intended.

2.6. Data Collection Procedure

A structured data collection sheet was developed based on the WHO SSCL implementation framework and adapted to the local context. It was pilot-tested in a non-participating hospital over one week for clarity, usability, and comprehensiveness. Feedback from this pilot phase was used to refine the tool before full deployment. While formal psychometric validation was not conducted, face and content validity were established through expert review by local clinicians and researchers. A copy of the final data collection tool is provided as **Supplement**. This sheet was used to collect the information in patient records including age, surgical indication, type of surgery (elective or emergency), surgeon's qualification, and SSCL availability. The checklist forms were reviewed on the following aspects: use of the SSCL (penetration) and the completeness of each of its three sections (fidelity).

Regarding staff interviews, demographic data (age, years of experience), prior training on patient safety, and self-reported reasons for partial or non-use of the checklist were recorded.

2.7. Data Management and Analysis

Data were cleaned, verified for accuracy, and recorded in Microsoft Excel before being exported to IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY) for analysis. Descriptive statistics, including frequencies, means, and percentages, were used to summarize the data. Associations between categorical variables were assessed using Chi-square tests. Statistical significance was set at $p < 0.05$, with 95% confidence intervals reported where appropriate.

2.8. Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea (Ref: 2023/1930-01/UB/SG/IRB/FHS; dated 02/02/2023). Additional administrative authorization was secured from all participating hospitals. Informed written consent was obtained from all surgical staff who participated in the interview phase of the study.

3. Results

Three hundred and six gynaecological and obstetrical surgeries were performed during the study period but 16 of them could not be observed by an investigator. We finally enrolled 290 procedures into the study distributed as indicated in **Figure 1** below. The majority of cases were recruited in GRH (73.79%) and the least

at the RHCG (5.18%).

3.1. Descriptive Results

- **General characteristics of patients, surgical indications and health workers**

Table 1 below displays the general characteristics of patients, surgical indications and health workers. Over 62% of surgeries were done as emergencies. Caesarean section contributed to more than 68% of the indications followed by myomectomy through laparotomy 25 (8.62%). The procedure was carried out by an obstetrician-gynaecologist in only 65% of cases.

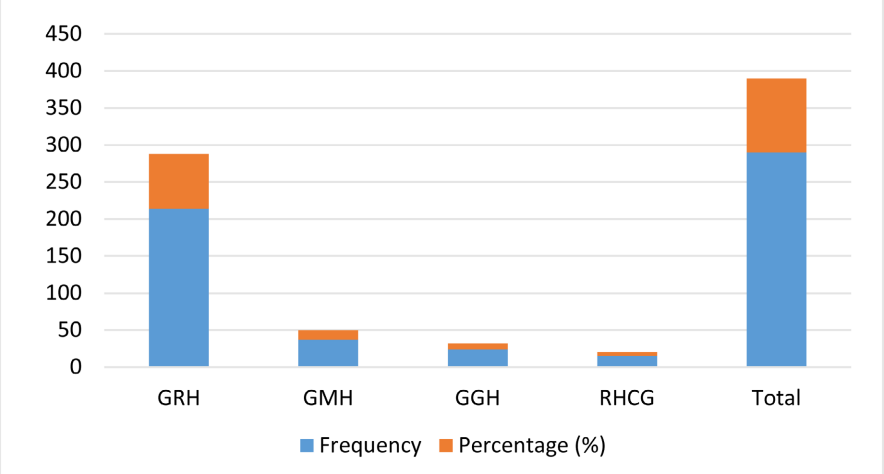

Figure 1. Distribution of participants in study sites.

Table 1. General characteristics of patients, surgical indications and health workers.

Variables		Frequency	Percentage (%)
Type of surgery	Emergency	182	62.76
	planned	108	37.24
Surgical indications	Caesarean section	198	68.28
	Myomectomy	25	8.62
	Extra uterine pregnancy	16	5.52
	Hysterectomy	14	4.82
	Mastectomy	02	0.69
	Others	35	12.06
Qualification of surgeon	OBGYN*	188	64.83
	GP**	92	31.72
	GS***	10	3.45

OBGYN*: obstetrician and gynaecologist; GP**: General practitioner; GS***: General surgeon.

- **Characteristics of staff members involved in SSCL**

The majority of the staff members were between the ages of 20 and 39 (81.1%),

with a smaller proportion aged 40 - 49 (15.7%) and over 50 (2.9%). In terms of work experience, most staff members have 1-5 years of experience (57.1%), followed by 6 - 10 years (15.7%), 11 - 15 years (15.7%), 16 - 20 years (2.9%), and over 20 years (8.6%). Finally, the majority of staff members have received training on Patient Safety (67.1%), while 32.9% have not (see Table 2).

3.2. Outcome Results

- **SSCL use and completeness**

As shown in Table 3 below, nearly 38% of study participants reported using SSCL while 62.07% did not. All participants (100%) completed sections 1 and 2 of the SSCL; 60.9% completed section 3, while 39.1% did not.

- **Staff members' viewpoints on the barriers to SSCL utilization**

Figure 2 below summarizes staff members' perspectives on the barriers to SSCL utilization. Out of 70 staff members interviewed, 56(80%) think that absence of training is a barrier to the use of SSCL; other obstacles mentioned include, in decreasing order inappropriate organization of the hospital (71.4%), insufficient

Table 2. Characteristics of staff members involved in SSCL.

Variables		Frequency (n = 70)	Percentage (%)
Age group	20 - 29	29	41.1
	30 - 39	28	40
	40 - 49	11	15.7
	>50	2	2.9
Work experience	1 - 5	40	57.1
	6 - 10	11	15.7
	11 - 15	11	15.7
	16 - 20	2	2.9
	>20	6	8.6
Training on PS	Yes	47	67.1
	No	23	32.9

Table 3. SSCL use and completeness.

Variables		Frequency (Percentage %)	
SSCL compliance	Yes	110 (37.93%)	
	NO	180 (62.07%)	
		Completed	Not completed
	Section 1	110 (100%)	00
	Section 2	110 (100%)	0.0
	Section 3	67 (60.9%)	43 (39.1%)

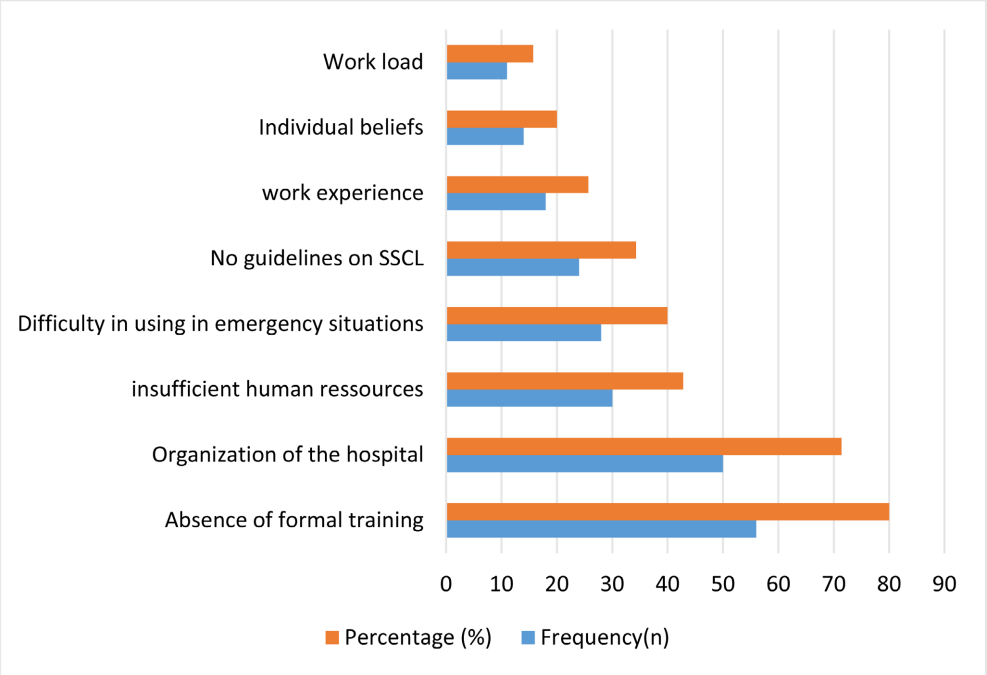

Figure 2. Staff viewpoints on the barriers to SSCL utilization.

human resources (42.8%), difficulties related to emergency situations 26 cases (40%).

Lack of guidelines on SSCL (Safe Surgery Checklist): 22 cases (33.8%). The Heavy workload was the factor mentioned by the least number of participants 11(15.7%).

- **Factors associated to the quality of checklist use**

This Table 4 analyzes the association between various factors and the use of a safety checklist. It uses odds ratios (OR) and p-values to assess the significance of these associations. Having established guidelines (p-value < 0.001), Facilities with

Table 4. Factors associated to quality of checklist use.

Variables		Well filled	Poorly filled	OR	P value
Guidelines available	Yes	64	3	284.4	<0.001
	No	3	40		
Good work organization	Yes	62	5	94.24	<0.001
	No	5	38		
Teaching hospital	Yes	58	9	24.35	<0.001
	No	9	34		
Limited staff	Yes	19	24	0.3	0.58
	No	48	19		
Specialists	Yes	64	4	208	<0.001
	No	3	39		

good work organization (p-value < 0.001), being a teaching hospital (p-value < 0.001), procedures performed by specialists (p-value < 0.001) appear strongly linked to a higher likelihood of using appropriately a safety checklist. Conversely, limited staff members were associated to poor quality of SSCL but the difference is not statistically significant (p-value = 0.58).

4. Discussion

While prior studies in Cameroon have examined patient safety culture and medical errors [12]-[14], our study is among the first to quantitatively assess both compliance (use) and fidelity (completeness) of the Surgical Safety Checklist (SSCL) in obstetric and gynecologic surgeries, specifically in the underserved northern region. The results highlight a low SSCL compliance rate of 38%, underscoring the ongoing challenges in integrating this vital tool into routine surgical practice in semi-urban and resource-limited settings.

Compared to the global average compliance of 75.4%—with rates approaching 100% in high-income countries—the findings in our setting are markedly low and consistent with other LMICs struggling to institutionalize SSCL use [3] [15]-[18]. For example, reported compliance rates range from 39.7% to 94% in Ethiopia, 85% in Uganda, and 89.9% in Pakistan [19]. Our results align with data from East African referral hospitals, where checklist use has varied widely from 19% to 65% [19].

Encouragingly, the fidelity of checklist use in our study was relatively high when SSCLs were utilized: 100% completion of sections 1 and 2, with 61% overall completion. This mirrors trends observed in LMICs, where adherence to the full SSCL is often suboptimal—particularly the third section, the sign-out phase, which is most frequently neglected [9] [20]. For example, Tadiesse *et al.* in Ethiopia reported only 35% completion of the sign-out section [20], while implementation improvements in Pakistan raised that figure to 66.7% [21]. Our data suggest that when the checklist is started, there is a strong tendency to complete it at least partially, indicating latent awareness of its importance.

4.1. Barriers to SSCL Utilization: A COM-B Analysis

To better understand the underlying reasons for low SSCL uptake, our findings can be interpreted using the **COM-B model**—a behavioral framework emphasizing Capability, Opportunity, and Motivation as drivers of behavior:

- **Capability (Knowledge and Skills):**
  Most staff had not received formal training in patient safety or checklist use. This knowledge gap likely impaired their ability to apply the checklist correctly and consistently. This is consistent with prior studies highlighting that training significantly enhances both compliance and fidelity [9] [10].
- **Opportunity (Environment and Resources):**
  Structural limitations—such as inadequate staffing, overburdened personnel, and inconsistent leadership support—were frequently cited by respondents. Limited time during emergencies and lack of routine monitoring systems fur-

ther inhibited the integration of the SSCL into daily surgical practice.

- **Motivation (Beliefs and Attitudes):**
  Some staff perceived the checklist as optional or bureaucratic, especially during high-pressure situations. Additionally, leadership was not consistently engaged in promoting SSCL compliance, which may signal to staff that it is not a priority. Without reinforcement, the perceived value of the checklist remains low.

Teaching hospitals exhibited higher adherence rates, likely due to increased scrutiny, structured routines, and academic accountability. These institutions may offer a valuable platform for piloting training initiatives and reinforcing safety culture through role modeling and mentorship.

4.2. Implications for Policy and Practice

The findings have several implications. First, merely introducing the SSCL is insufficient—ongoing education, institutional accountability, and systemic reinforcement are essential. Embedding SSCL use into pre-operative workflows, supported by leadership and continuous monitoring, can foster long-term behavior change. Interventions based on the COM-B framework may provide structured pathways to improve uptake—e.g., targeted training (capability), process redesign and staff deployment (opportunity), and leadership engagement and incentive systems (motivation).

Integrating SSCL compliance into hospital quality improvement metrics and national surgical standards could help align behavior with health policy goals, particularly in the context of Cameroon's commitment following the 2019 Global Ministerial Summit on patient safety [12].

5. Study Limitations

This study was limited to four hospitals in northern Cameroon, which may affect the generalizability of the findings to other regions or hospital types. The sample size was relatively small and no formal power calculation was performed, as this was an exploratory study. Additionally, surgical outcomes were not assessed, limiting our ability to measure the direct impact of SSCL adherence on patient morbidity or mortality. The observational design may also introduce observer bias, despite the efforts made to train and schedule observers systematically.

6. Conclusions

This study revealed a 38% utilization rate of the SSCL in gynecologic and obstetric surgeries in northern Cameroon. While sections 1 and 2 of the checklist were fully completed when used, the sign-out section was often omitted, with 39% of cases lacking proper documentation. These findings highlight a critical gap in surgical safety practices and call for targeted interventions to improve SSCL compliance and fidelity.

Improving patient safety in Cameroon and similar LMICs requires a multifaceted approach: increasing staff training (capability), enhancing resources and workflow organization (opportunity), and fostering a culture that values safety

and accountability (motivation). Leveraging models like COM-B may guide the design of effective, context-specific interventions.

What Is Already Known about Surgical Safety Checklist?

- The WHO Surgical Safety Checklist (SSCL) improves surgical outcomes and reduces complications when consistently and correctly used.
- SSCL utilization is high in high-income countries but varies widely in LMICs.
- Even where the SSCL has been introduced, adherence remains inconsistent due to structural and behavioral challenges.

What This Study Adds

- This study reports a SSCL utilization rate below 50% in a semi-urban, resource-limited region of Cameroon.
- It identifies specific, actionable barriers to SSCL implementation—including staff training deficits, workforce shortages, and poor organizational structures.
- Using the COM-B framework, the study provides a theoretical basis for designing tailored interventions to improve checklist use and surgical safety.

Authors' Contributions

TR, NNT, MEI, and IR conceptualized and designed the study. Participants were recruited at the sites by DB and IBE and IR. CN participated in participant recruitment and reviewed the manuscript. In addition, TR, NC, KD wrote the manuscript. NNT revised and scrutinized the study for important intellectual content. All the authors read and approved the final version of the manuscript.

Funding

There was no funding for this research.

Availability of Data

The dataset that was used and analyzed in this study is not publicly available due to ethical considerations. Upon reasonable request, the dataset used is available with the permission of the corresponding author, Dr. Robert Tchounzou.

Ethical Considerations and Consent to Participate

Ethical clearance was obtained from the faculty of Health Sciences of the University of Buea under following reference: Ref. 2023/1930-01/UB/SG/IRB/FHS of 2nd February 2023; administration authorizations were obtained from the directors of different health institutions. For the second part of the study, written consent to participate was sought and obtained from hospital staff.

Consent for Publication

Not applicable.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Supplement

Data Collection Tool: Modified from WHO Surgical Safety Checklist

Instructions for Use:

- One form per surgery observed.
- If no SSCL was used, skip Section C and complete Sections B, D, and E.
- Attach SSCL copy (if available) for cross-verification.

Use this data to assess compliance (whether SSCL was used) and fidelity (completeness of each phase)

Item	Description	Response
Section I: Patient and Procedure information		
Q1	Hospital Name	[Text]
Q2	Date of Surgery	[DD/MM/YYYY]
Q3	Time of Surgery Start	[HH:MM]
Q4	Type of Procedure	☐ Cesarean Section ☐ Hysterectomy ☐ Myomectomy ☐ EP ☐ Mastectomy ☐ Other
Q5	Surgery Type	☐ Elective ☐ Emergency
Q6	Anesthesia Type	☐ General ☐ Regional ☐ Local
Q7	Surgeon Qualification	☐ Obstetrician-Gynecologist ☐ General Surgeon ☐ General Practitioner
Q8	Was an SSCL form available in patient file or operating room?	☐ Yes ☐ No
Section II: Compliance (Penetration)		
Q9	Was the SSCL used during the surgery?	☐ Yes ☐ No
Q10	If "No," state reason (select all that apply)	☐ Not available ☐ Not aware of SSCL ☐ Emergency case ☐ Lack of time ☐ Individual beliefs ☐ insufficient human resources ☐ work organization ☐ Other_____
Section III: Fidelity (Completeness of Checklist Use)		
Checklist Phase	**Was the Section Completed?**	**Who Led the Section?**
Q11 **Sign-In** (Before anesthesia)	☐ Yes ☐ No	☐ Nurse ☐ Anesthetist ☐ Surgeon ☐ Other: _____
Q12 **Time-Out** (Before incision)	☐ Yes ☐ No	☐ Nurse ☐ Surgeon ☐ Team Leader ☐ Other: _____
Q13 **Sign-Out** (Before patient leaves OR)	☐ Yes ☐ No	☐ Nurse ☐ Surgeon ☐ Other: _____
Section IV: Barriers to SSCL use (Staff characteristics)		
Q14 Age group	Staff's age in years	☐ 20 - 29 ☐ 30 - 39 ☐ 40 - 49 ☐ >50
Q15 Work experience	Numbers of years of experience	☐ 1 - 5 ☐ 6 - 10 ☐ 11 - 15 ☐ 16 - 20 ☐>20
Q16 Ever receive training of Patient Safety	Training in Patient Safety including use of SSCL	☐ Yes ☐ No

Continued

Section V: Observed Barriers During Surgery (*Tick all that apply (observer's judgment or staff comments).*		
Barrier	**Observed?**	**Notes**
Q17	Inadequate staffing during operation	☐ Yes ☐ No
Q18	Lack of SSCL-related training	☐ Yes ☐ No
Q19	Team members not engaged in checklist steps	☐ Yes ☐ No
Q20	Checklist steps skipped due to urgency	☐ Yes ☐ No
Q21	Poor intra-team communication	☐ Yes ☐ No
Q22	Language barrier or poor comprehension	☐ Yes ☐ No
Section VI: Observer Details		
Q23	Observer Name/Code	[Text]
Q24	Date of Observation	[DD/MM/YYYY]
Q25	Shift Type	☐ Day ☐ Night ☐ Weekend
Q26	Observer Name/Code	[Text]

Q: question.