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Adherence to minimum service standards of hospital pharmacy practice by provincial hospitals of Nepal: a retrospective secondary study

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Adherence to minimum service standards of hospital pharmacy practice by provincial hospitals of Nepal: a retrospective secondary study

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Abstract

Background

There is a positive growth in the hospital pharmaceutical services within provinces of Nepal. This growth reflects the continuous quality improvement by the hospital using tools such as minimum service standards (MSS), as such, this study aims to assess the adherence to MSS of hospital pharmacy practice by the provincial hospitals of Bagmati province, Nepal.

Methods

A retrospective secondary analysis was conducted of provincial hospitals from Bagmati Province, Nepal executing hospital pharmacy practice services where the tools used within the study included the MSS Checklist to identify the Gaps in Quality Improvement of Primary Hospitals, MSS assessment tool (Self and Joint) for Secondary A Hospital, and the MSS assessment tool (self and Joint) for Secondary B Hospital endorsed by the Quality Standards and Regulation Division, Ministry of Health and Population, Government of Nepal. The analysis was then reflected in terms of MSS scores (%) such as poor (<50), state of improving status emphasizing specific target areas (50 to <70), acceptance level that requires careful specific interventions (70 to <85) and 85-100 optimal level of readiness to provide services that require sustained efforts to maintain the level and move towards 100%.

Results

The survey included 13 hospitals located in the Bagmati Province of Nepal: 3 categorized as Primary hospitals, 4 as Secondary A hospitals, and 6 as Secondary B hospitals. Overall, the findings indicate better MSS performance in secondary B level hospitals compared to secondary A and primary hospitals. Out of 13 hospitals, the majority showed acceptance level (70 to <85)

that requires careful intervention (n=7; 54%), followed by hospital pharmacy within very poor and alarming status (<50) that needs to be addressed first (n=2, 15%), improving status (50 to <70) requiring specific targeted areas support (n=2, 15%), and pharmacies with optimal level (85-100) of readiness to provide the service that require sustained efforts to maintain the level (n=2, 15%). Despite positive growth in the development of hospital formulary within hospitals, standards such as good procurement practice, staffing, information to patients, pharmacovigilance and ADR reporting, and pharmaceutical waste management were still poorly complaint.

Conclusions

Out of 13 provincial hospitals majority revealed an acceptance level that requires careful intervention. The findings emphasize the need for integrated approach from the Ministry of health, hospital development committee, and the drug and therapeutic committee to fulfil the standards and help in the proper pharmaceutical care continuum with provincial based hospital pharmacies.

Keywords: Minimum standard service; Pharmaceutical policy; Bagmati province; Nepal; Quality improvement

Background

Hospital pharmacy services are an essential part of healthcare delivery systems and are vital to the safe, efficient, and sensible administration of medications. Through organized drug management systems, clinical pharmacy services, and interdisciplinary teamwork, high-quality hospital pharmacy practice, along with a multidisciplinary team, promotes patient safety, therapeutic efficacy, and effective use of healthcare resources [1–5]. Globally, in the contemporary period, the hospital pharmacy practice has evolved from a product-oriented function toward a patient-centered clinical role, supported by standardized professional guidelines and quality frameworks [6,7].

The American Society of Health-System Pharmacists (ASHP), United States of America (USA) has developed evidence-based guidelines that specify the minimal standards for hospital pharmacy services on a global scale. The ASHP Minimum Standard for Pharmacies in Hospitals outlines expectations across key domains, including practice management, medication-use policy development, procurement and inventory management, preparation and dispensing of medicines, clinical pharmacy services, medication-use evaluation, and continuous quality improvement [8]. These standards are widely regarded as global benchmarks and have been associated with reductions in medication errors, improvements in medication safety, and enhanced patient outcomes [8–10]. The growing range of clinical pharmacy services is further demonstrated by data from subsequent ASHP National Surveys of Pharmacy Practice in Hospital Settings, highlighting the significance of standardized frameworks to direct service delivery and workforce development [11].

Similarly, the World Health Organization (WHO) and the International Pharmaceutical Federation (FIP) have placed a strong emphasis on the use of Good Pharmacy Practice (GPP) on a global scale to guarantee that pharmacy services continuously fulfill quality, safety, and efficacy

requirements. The WHO-FIP GPP guidelines promote patient-centered care, professional accountability, and continuous enhancement of quality, especially in low- and middle-income nations where health systems continue to struggle with capacity and resource limitations [12]. All these guidelines, checklist and standards help in elevating the service of hospital pharmacy practice.

Nepal, a low-middle-income country (LMIC), is also on the verge of developing its health indicators along with improvement in quality pharmaceutical health indicators [3]. The Quality Standards and Regulation Division, Ministry of Health and Population, Government of Nepal has introduced the Minimum Service Standards (MSS), which have strengthened the country's attempts to institutionalize healthcare quality through a checklist. In order to guarantee that public health facilities provide a specified minimum level of services with adequate quality, safety, and efficiency, MSS offers a framework that has been approved nationally [13]. The MSS framework encompasses governance and management, human resources, infrastructure, infection prevention and control, clinical services, and support services [3,13]. Similarly, the hospital pharmacy services are also incorporated within the clinical service standards, with indicators addressing medicine selection, procurement, storage conditions, inventory management, dispensing practices, documentation, patient counseling, and rational use of medicines [3,13]. The MSS checklist acts as feasible and practical tool for assessing hospital pharmacy services and identifying areas for quality improvement [3]. Studies conducted in public and provincial hospital settings have demonstrated variability in adherence to pharmacy service standards and highlighted the need for structured, standards-based monitoring mechanisms to strengthen medication management and patient safety [3,4]. Alignment of hospital pharmacy practice with MSS also complements national regulatory initiatives, including the implementation of GPP and Good Storage and Distribution

Practice (GSDP) guidelines issued by the Department of Drug Administration, the National Drug Regulatory Authority of Nepal [14]. Nepal's transition to a federal governance system in 2015 drastically restructured health service delivery, assigning provincial and local governments a central role in the management and oversight of hospitals and health sectors with prominent challenges [15,16]. While decentralization has enabled specific planning and service expansion, it has also introduced challenges in maintaining uniform service standards, regulatory oversight, resource management, and quality assurance across provinces [15,17]. Bagmati Province, one of Nepal's most populous and service-intensive provinces, hosts a wide network of provincial hospitals that serve increasing patient volumes and increasingly complex clinical needs. As hospital services expand, the role of hospital pharmacies in ensuring medicine availability, safe dispensing, and rational use becomes increasingly critical and prudent.

Despite the central role of hospital pharmacy services within provincial health systems, systematic evidence on adherence to MSS for hospital pharmacy practice at the provincial level remains limited. In the context of federalization and expanding provincial health responsibilities, evaluating MSS adherence is essential to generate evidence that can inform quality improvement initiatives, support regulatory oversight, and guide policy decisions. Therefore, this study aims to assess the adherence to MSS of hospital pharmacy practice by provincial hospitals of Bagmati Province, Nepal, using a retrospective secondary analysis of MSS indicators, with the goal of identifying strengths, gaps, and priority areas for strengthening pharmacy services in the province.

Methods

A retrospective secondary analysis was conducted to assess the adherence of MSS for hospital pharmacy practice services of 13 provincial hospital from Bagmati Province, Nepal with the fiscal year (FY) 2024/2025 data extracted from the Directorate of Health, Ministry of Health, Bagmati

Province subsequent to ethical approval and letter of approval from the Ministry of Health, Bagmati Province, Nepal. Government provincial hospital with dedicated hospital pharmacy practice services within the Bagmati province, Nepal, was included, whereas federally executed, private hospital/institution, and local-level based provincial hospitals running hospital pharmacy services were excluded.

Study Site

A total of 13 hospitals: Primary Hospital (n=3), Secondary A hospital (n=4), and Secondary B Hospital (n=6) of Bagmati province that went through rigorous MSS assessment for the fiscal year 2024/25 pertaining to hospital pharmacy services as outlined in the Clinical service management standards with its subdomain standard code 2.5 Hospital Pharmacy Service [18–20] were included (**Table 1**).

Table 1: MSS Implemented Hospitals of Bagmati Province, FY 2024/25 that were included

SN	Provincial level (13) – Included	Category of Hospital
1	Rasuwa Hospital Rasuwa	Primary
2	Bajrabarahi Chapagaun Hospital, Lalitpur	Primary
3	Tokha Chandeshori Hospital, Kathmadu	Primary
4	Pashupati Chaulagain Smirti Hospital, Dolakha	Secondary A
5	Methinkot Hosptial, Kavrepalanchowk	Secondary A
6	Chautara Hospital, Sindhupalchowk	Secondary A
7	Ramechhap District Hospital	Secondary A
8	Hetauda Hospital Makwanpur	Secondary B
9	Dhading Hospital Dhading	Secondary B
10	Sindhuli Hospital Sindhuli	Secondary B
11	Trishuli Hospital, Nuwakot	Secondary B
12	Bhaktapur Hospital, Bhaktapur	Secondary B
13	Bakulahar Ratnanagar Hospital, Chitwan	Secondary B
SN	**Local level (3) – Excluded**	**Category of Hospital**
1	Baghauda Hospital, Chitwan	Primary
2	Jiri Hospital, Dolakha	Primary

3	Badegaun Hospital, Lalitpur	Primary

Note: The table represents the hospitals of Bagmati Province of Nepal with their location and categories. The 13 hospital that fell within our inclusion criteria are were only analyzed for the MSS assessment in terms of hospital pharmacy practice service code 2.5. In this context, Primary hospital means a hospital with a capacity of up to 15 beds providing services as per the minimum service standards. Secondary hospital (A) means a hospital that provides the services as prescribed by the minimum service standards and will generally have 50 to 100 beds. Secondary hospital (B) means a hospital that provides the services as determined by the minimum service standard and will generally have of 100 to 300 beds.

Tools Used

The tools used within the study were the MSS Checklist to identify the Gaps in Quality Improvement of Primary Hospitals [18], MSS assessment tool (Self and Joint) for Secondary A Hospital [19], and the MSS assessment tool (self and Joint) for Secondary B Hospital [20] endorsed by the Quality Standards and Regulation Division, Ministry of Health and Population, Government of Nepal **(Table 2)**.

Primary Hospital

MSS Checklist to identify the Gaps in Quality Improvement of Primary Hospitals tool [18] was used, which is categorized into three sections: Governance, Clinical Services, and Support Services, where the clinical service section incorporates the hospital pharmacy service with standard code 2.5. The code consists of 19 components and 36 sets of standards, with a total score of 40 (**Table 2**). Each standard has a separate score, and the total score in each code is considered

to compare the quality of service. The components include availability of pharmacy units (Score 1), governance committee for hospital pharmacy services with standards such as provision of Drug Therapeutic Committee (DTC) and Hospital Pharmacy Committee, with (Score 2), availability of hospital formulary (Score 4), Good Procurement practice (Score 6), pharmacy service hours (Score 1), staffing as per hospital service guidelines 2072 (Score 3), free medicine list display (Score 1), medicine availability according to specific programs (Score 3), availability of inpatient pharmacy service (Score 1), electronic record keeping (Score 1), availability of pharmacy stock (Score 3), display and storage of medicines (Score 3), information to patient (Score 3), generic prescription (Score 1), dispensing medicines (Score 2), use of First Expiry First Out (FEFO) system (1), pharmacy inventory (1), drug utilization review and quantification (Score 2), pharmaceutical waste disposal (Score 2). To identify gaps and areas that require quality improvement, the checklist provides an organized rating system [18].

Secondary A Hospital

For Secondary A Hospital, the *MSS Assessment Tool (Self and Joint) for Secondary A Hospital* was used [19]. Compared to primary hospitals, this tool has a more comprehensive set of criteria and adheres to a similar framework that includes Governance, Clinical Services, and Support Services. Similarly, the hospital service falls under clinical service management with standard code 2.5 (**Table 2**). The section has 19 components and 35 standards with a total score of 39. Each standard has a minimum of one score and a maximum of three scores. Most of the components and standards are similar to the *MSS Assessment Tool for primary hospitals* [18].

Secondary B Hospital

For Secondary B Hospital, the *MSS assessment tool (self and Joint) Secondary B Hospital* was used [20]. The most complete MSS framework is represented by this tool, which reflects secondary B hospitals' higher standards for service delivery. A greater number of standards and indicators about governance structures, formulary management, procurement and tender procedures, medication quality assurance, storage and inventory control, staffing in accordance with national guidelines, round-the-clock pharmacy services, patient information, and the availability of medications for national health programs are included in the Hospital Pharmacy Service section (Code 2.5) under clinical services section of this tool (**Table 2**). Each standard has a minimum score of one and a maximum score 3 while the section consists of 19 components and 36 standards with a total score of 40 [20].

Table 2. MSS assessment tools within Primary, Secondary A, and Secondary B hospitals with a number of standards and scores

MSS Primary hospital	**Section**	**No of standards**	**Maximum score**
I	Governance	105	109
II	Clinical service	417	519
	2.5 Hospital Pharmacy Service	36	40
III	Support Service	124	132
MSS Secondary A	**Section**	**No of standards**	**Maximum score**
I	Governance	105	109
II	Clinical service	478	682
	2.5 Hospital Pharmacy Service	35	39
III	Support Service	138	148
MSS Secondary B	**Section**	**No of standards**	**Maximum score**
I	Governance	106	110
II	Clinical service	828	1097
	2.5 Hospital Pharmacy Service	36	40
III	Support Service	139	149

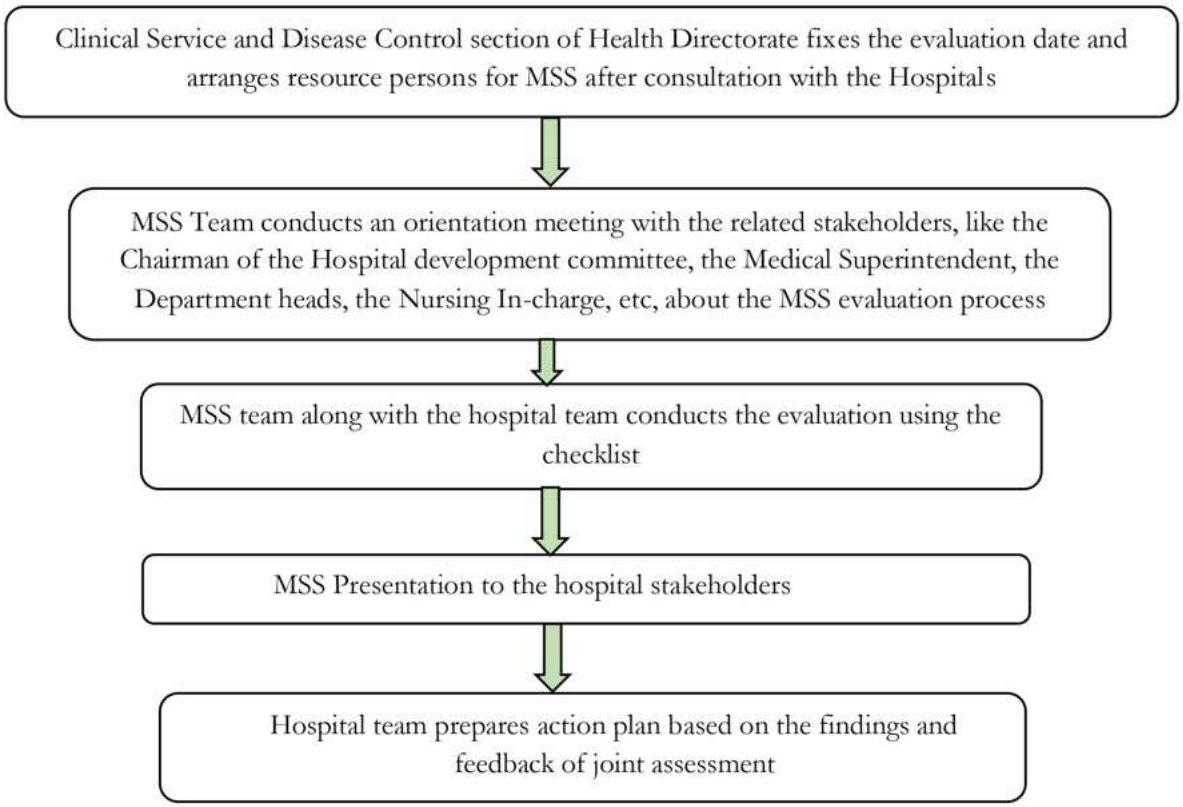
Note: The table is prepared by taking the reference from the MSS checklist for primary hospital [18], secondary A [19] and secondary B hospital [20].

Data collection process

MSS scores were specifically extracted from the Pharmacy Services Section of the MSS evaluation tool. Data were taken from the score sheets documenting performance against all standard indicators in the pharmacy services domain. The extracted variables included hospital level (Primary, Secondary A, Secondary B), number of standards assessed in pharmacy services, achieved score for each standard, total attainable score for pharmacy services. No changes were made to the original scoring entries. Each standard is assessed and scored based on the compliance status recorded during the official MSS evaluation (**Figure 1. MSS Evaluation Process**). Scores were calculated using the following formula:

$$Pharmacy\ MSS\ Score\ (\%) = \frac{Total\ Achieved\ Score}{Total\ Attainable\ Score} \times 100$$

The study used secondary data obtained from the official MSS evaluation records maintained by the Health Directorate of Bagmati Province, Nepal. These records were generated through formal MSS assessments conducted by authorized evaluation teams.



< **Figure 1 to be inserted here>**

Data analysis

The data, once retrospectively retrieved, were analyzed on Microsoft Excel 2021. Entered data were cross-verified by authors NP, SB, PKJ, and SK to ensure there were no errors. The analysis was then reflected in terms of MSS scores (%) such as poor (<50), state of improving status emphasizing specific target areas (50 to <70), acceptance level that requires careful specific interventions (70 to <85) and 85-100 optimal level of readiness to provide services that require sustained efforts to maintain the level and move towards 100% conducted as per the section "Interpretation of the MSS Score" outlined by the Government of Nepal, Ministry of Health and

Population, Quality Standards and Regulation Division [18–20]. Data were represented in terms of scores and percentages.

Results

The service readiness and availability of tools required for hospitals to provide MSS were examined retrospectively; as such, this study identified gaps in quality improvement expectations in the hospitals. The survey included 13 hospitals located in the Bagmati Province of Nepal: 3 categorized as Primary hospitals, 4 as Secondary A hospitals, and 6 as Secondary B hospitals.

Overall MSS Scoring of Hospitals

Among primary level hospitals, *Bajrabarahi Chapagaun* Hospital, Lalitpur, and *Tokha Chandeshori* Hospital, Kathmandu, achieved an acceptable level of performance, while *Rasuwa* Hospital, Rasuwa, was at an improving stage, indicating partial compliance with MSS standards (**Table 3**). For secondary-B hospitals, overall performance was relatively stronger. *Bhaktapur* Hospital, Bhaktapur, achieved an optimal level, while *Trishuli* Hospital, Nuwakot, *Dhading* Hospital, Dhading, and *Bakulahar Ratnanagar* Hospital, Chitwan, maintained an acceptable status. *Hetauda* Hospital Makwanpur, and *Sindhuli* Hospital Sindhuli were categorized as under the acceptance level, suggesting moderate compliance with scope for further system strengthening.

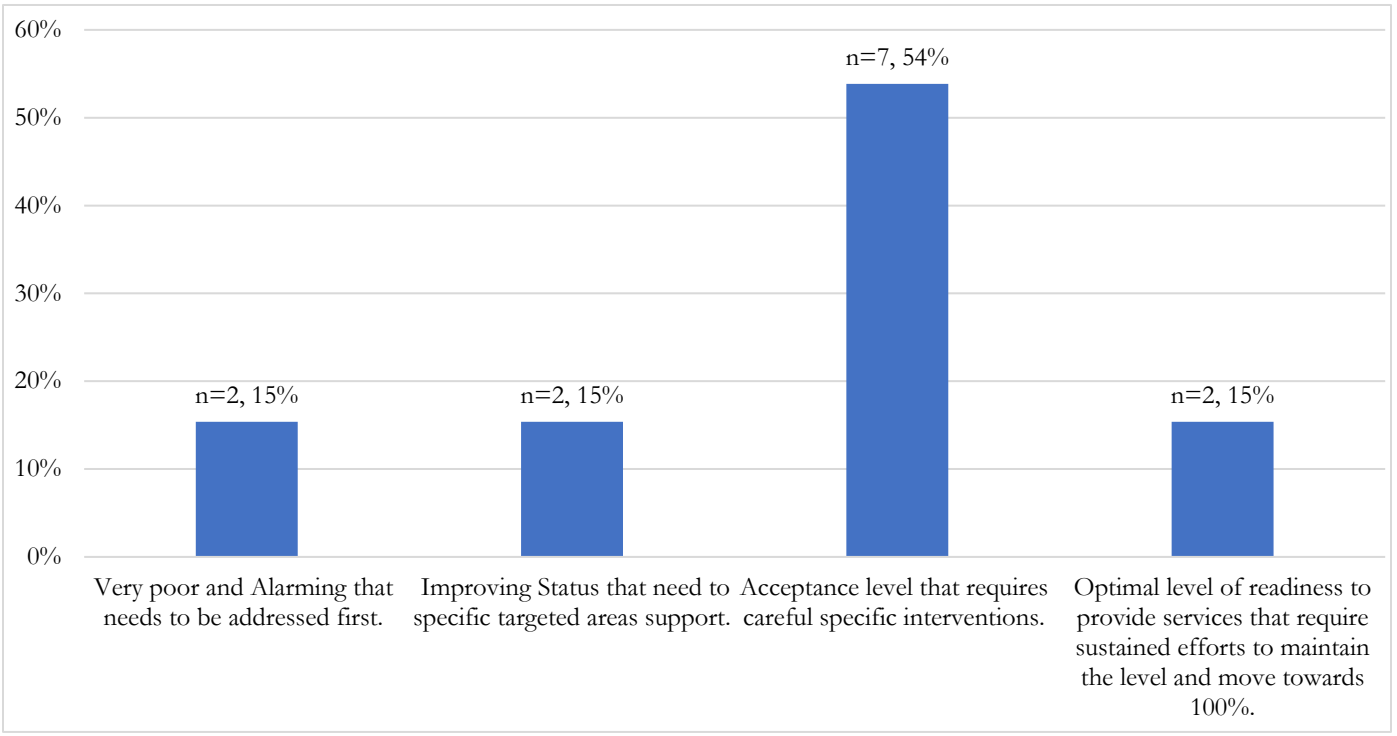
Table 3. Overall MSS Score and Status of Hospitals

Hospitals	Overall MSS Score (%)	Status
Primary Level Hospital		
Bajrabarahi Chapagaun Hospital, Lalitpur	72.5	Acceptable Level
Tokha Chandeshori Hospital, Kathmadu	72.5	Acceptable Level
Rasuwa Hospital, Rasuwa	55	Improving
Secondary A Hospital		
Methinkot Hosptial, Kavrepalanchowk	49	Very poor and Alarming

Chautara Hospital, Sindhupalchowk	85	Optimal Level
Ramechhap District Hospital	77	Acceptable Level
Pashupati Chaulagain Smirti Hospital, Dolakha	38	Very Poor and Alarming
Secondary B Hospital		
Trishuli Hospital, Nuwakot	77.5	Acceptable Level
Dhading Hospital, Dhading	70	Acceptable Level
Bhaktapur Hospital, Bhaktapur	97.5	Optimal Level
Bakulahar Ratnanagar Hospital, Chitwan	80	Acceptable Level
Hetauda Hospital, Makwanpur	67.5	Improving
Sindhuli Hospital, Sindhuli	70	Acceptance Level

Note: This table includes the primary, secondary A and secondary B with the MSS scores and the status.

Within secondary-A hospitals, *Chautara* Hospital, Sindhupalchowk demonstrated optimal performance, followed by Ramechhap District Hospital at an acceptable level. *Methinkot* Hosptial, Kavrepalanchowk and *Pashupati Chaulagain Smirti* Hospital, Dolakha, showed a very poor and alarming status, highlighting significant deficiencies in MSS implementation. Overall, the findings indicate better MSS performance in secondary B level hospitals compared to secondary A and primary hospitals, while the presence of very poor scores at all levels underscores the need for targeted interventions, workforce strengthening, and systematic monitoring to ensure uniform quality improvement across hospitals. Out of 13 hospitals, the majority showed acceptance level (70 to <85) that requires careful intervention (n=7; 54%), followed by hospital pharmacy within very poor and alarming status (<50) that needs to be addressed first (n=2, 15%), improving status (50 to <70) requiring specific targeted areas support (n=2, 15%), optimal level (85-100) of readiness to provide the service that require sustained efforts to maintain the level (n=2, 15%) [**Figure 2. Frequencies and percentages of MSS status of included hospitals**]. MSS assessment scores of hospital pharmacy service for primary, secondary A and secondary B for 13 hospitals is shown in **Table 4-6.**



<Figure 2 to be inserted here>

256 **Table 4. MSS assessment of Hospital Pharmacy service (Code 2.5) for Primary Hospital**

Components	Code	Standards	Bajrabarahi Chapagaun Hospital	Tokha Chandeshori Hospital	Rasuwa Hospital	Maximum score
			Obtained Score	Obtained Score	Obtained Score	
2.5.1 Pharmacy unit available	2.5.1	Hospital has designated pharmacy unit	1	1	1	1
2.5.2 Governance committee for hospital pharmacy services	2.5.2.1	Drug and Therapeutic Committee	1	1	1	1
	2.5.2.2	Hospital Pharmacy operation committee	1	1	1	1
2.5.3 Hospital Formulary Heading: Availability of medicine and supplies	2.5.3.1	Hospital has prepared formulary list based on Nepalese National Formulary (NNF) approved by DTC	1	1	1	1
	2.5.3.2	Hospital pharmacy has all free drugs available round the clock (*refer to free drug list of government for hospitals)	1	1	0	1
	2.5.3.3	Hospital formulary list includes all medicines and supplies as per services provided by hospital	1	1	1	1
	2.5.3.4	Hospital has all, medicines and supplies available as per approved hospital formulary list	1	0	1	1
2.5.4 Good Procurement Practice	2.5.4.1	Annual procurement plan for medicines and supplies for pharmacy services is available	0	1	0	1
	2.5.4.2	Procurement is done based on public procurement guideline	1	1	0	1

Components	Code	Standards	Bajrabarahi Chapagaun Hospital	Tokha Chandeshori Hospital	Rasuwa Hospital	Maximum score
			Obtained Score	Obtained Score	Obtained Score	
	2.5.4.3	Product specification for each medicine and related supplies of approved formulary list is available	0	1	0	1
	2.5.4.4	Technical criteria on quality assurance of procured medicines is included in tender document	0	0	0	1
	2.5.4.5	Certificate of analysis (CoA) from manufacturer of each batch of procured medicine is available	0	0	0	1
	2.5.4.6	Selling price of the drugs does not exceed 20% of the procurement price	1	1	1	1
2.5.5 Pharmacy Services Hours	2.5.5.1	The pharmacy is open 24x7	1	1	1	1
2.5.6 Staffing as per Hospital Pharmacy Services guideline 2072	2.5.6.1	Pharmacy unit is led by at least one clinical pharmacist	1	1	0	1
	2.5.6.2	Pharmacy has at least 3 pharmacist, 6 assistant pharmacist and 2 office assistants	1	1	1	1
	2.5.6.3	Duty roster of pharmacy to cover 24 hours service is prepared and visibly placed	1	1	1	1
2.5.7 Display of List of Free Medicine	2.5.7	The list of free medicines is displayed in a clearly visible place.	1	1	1	1

Components	Code	Standards	Bajrabarahi Chapagaun Hospital	Tokha Chandeshori Hospital	Rasuwa Hospital	Maximum score
			Obtained Score	Obtained Score	Obtained Score	
2.5.8 Availability of Medicine for Specific Programs	2.5.8	All of the required medicines and supplies for specific programs are available in pharmacy (less than 50%= 0; 50-70 =1, 70-85=2 85 100= 3)	3	2	1	3
2.5.9 Inpatient Pharmacy Services Available	2.5.9	Hospital pharmacy directly supplies inpatient medicine and supplies to wards and OT	0	0	1	1
2.5.10 Electronic Records Keeping	2.5.10	Pharmacy uses computer with software for inventory management and medicine use	1	1	1	1
2.5.11 Pharmacy Stock Available	2.5.11	Number of items of hospital formulary stocked in pharmacy (less than 50%= 0; 50 70 =1, 70-85=2 85-100= 3)	3	2	2	3
2.5.12 Display and Storage of Medicine	2.5.12.1	All the medicines and supplies are displayed in clean racks following either alphabetical orders and generic names or grouping as use	1	1	1	1
	2.5.12.2	Temperature of pharmacy is monitored and recorded and is maintained in range of (25+/ 2°C)	1	1	0	1
	2.5.12.3	Functional freeze +/-4°C for thermolabile medicine	1	1	1	1
2.5.13 Information to Patients	2.5.13.1	Pharmacy department has its allocated separate information and counseling unit with reference books or e-books	0	0	0	1

Components	Code	Standards	Bajrabarahi Chapagaun Hospital	Tokha Chandeshori Hospital	Rasuwa Hospital	Maximum score
			Obtained Score	Obtained Score	Obtained Score	
	2.5.13.2	Information regarding the medicines is provided to the patients.	1	1	1	1
	2.5.13.3	IEC materials (posters, 19eaf lets, national hospital formulary) about the appropriate use for medicines are available in the pharmacy area.	0	1	0	1
2.5.14 Generic Prescription	2.5.14	Hospital has pre-printed list of medicines for generic prescription available	1	0	0	1
2.5.15 Dispensing Medicine	2.5.15.1	Medicine is dispensed using electronic billing with barcode system	0	1	1	1
	2.5.15.2	Each medicine is given with written instructions on how to take	1	1	1	1
2.5.16 First Expiry First Out	2.5.16	FEFO system is maintained using standard stock book/cards.	1	1	0	1
2.5.17 Pharmacy Inventory	2.5.17	Every month, all medicines and supplies are counted, out- of-date discarded, and tallied with the medical store.	1	1	1	1
2.5.18 Drug Utilization Review and Quantification of Data	2.5.18.1	Pharmacy department operates pharmacovigilance activities and adverse drug reaction (ADR) Reporting	0	0	0	1
	2.5.18.2	Pharmacy department conducts studies on drug utilization and quantification	0	0	0	1

Components	Code	Standards	Bajrabarahi Chapagaun Hospital	Tokha Chandeshori Hospital	Rasuwa Hospital	Maximum score
			Obtained Score	Obtained Score	Obtained Score	
2.5.19 Pharmaceutical Waste Disposal	2.5.19	Pharmaceutical waste (expired or unused pharmaceutical products, spilled contaminated pharmaceutical products surplus drugs, vaccines or sera, etc) management is done based on HCWM guideline 2014 (MoHP) or returned to the supplier on time	0	0	0	1
Standard 2.5		**Total Obtained Score**	**29**	**29**	22	**40**
		Total Percentage (Total Obtained Score/40 x100)	**72.50 %**	**72.50%**	**55.00%**	

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263 **Table 5. MSS assessment of Hospital Pharmacy service (Code 2.5) for Secondary A Hospital**

Components	Code	Standards	Mithinkot Gospital	Chautara Hospital	Ramechhap Hospital	Pashupati Chaulagain	Maximum score
			Obtained Score	Obtained Score	Obtained Score	Obtained Score	
2.5.1 Pharmacy unit available	2.5.1	Hospital has designated pharmacy unit	1	1	1	1	1
2.5.2 Gorvernance committee for hospital pharmacy services	2.5.2.1	Drug and Therapeutic Committee	1	1	1	1	1
	2.5.2.2	Hospital Pharmacy operation committee	1	1	1	1	1
2.5.3 Hospital Formulary Heading: Availability of medicine and supplies	2.5.3.1	Hospital has prepared formulary list based on Nepalese National Formulary (NNF) approved by DTC	1	1	1	0	1
	2.5.3.2	Hospital pharmacy has all free drugs available round the clock (*refer to free drug list of government for hospitals)	1	1	1	0	1
	2.5.3.3	Hospital has all, medicines and supplies available as per approved hospital formulary list	1	1	1	0	1
2.5.4 Good Procurement Practice	2.5.4.1	Annual procurement plan for medicines and supplies for pharmacy services is available	0	1	1	0	1
	2.5.4.2	Procurement is done based on public procurement guideline	1	1	1	0	1
	2.5.4.3	Product specification for each medicine and related supplies of approved formulary list is available	1	1	1	0	1
	2.5.4.4	Technical criteria on quality assurance of procured medicines is included in tender document	0	1	1	1	1

	2.5.4.5	Certificate of analysis (CoA) from manufacturer of each batch of procured medicine is available	0	1	1	0	1
	2.5.4.6	Selling price of the drugs does not exceed 20% of the procurement price	0	1	1	1	1
2.5.5 Pharmacy Services Hours	2.5.5	The pharmacy is open 24x7	1	1	1	1	1
2.5.6 Staffing as per Hospital Pharmacy Services guideline 2072	2.5.6.1	Pharmacy unit is led by at least one pharmacist	0	1	0	0	1
	2.5.6.2	Pharmacy has at least one assistant pharmacist and one office assistants in each shift	0	0	0	0	1
	2.5.6.3	Duty roster of pharmacy to cover 24 hours service is prepared and visibly placed	1	1	1	1	1
2.5.7 Display of List of Free Medicine	2.5.7	The list of free medicines is displayed in a clearly visible place.	1	1	1	1	1
2.5.8 Availability of Medicine for Specific Programs	2.5.8	All of the required medicines and supplies for specific programs are available in pharmacy (less than 50%= 0; 50-70 =1, 70-85=2 85 100= 3)	0	1	1	1	3
2.5.9 Inpatient Pharmacy Services Available	2.5.9	Hospital pharmacy directly supplies inpatient medicine and supplies to wards and OT	0	1	1	0	1
2.5.10 Electronic Records Keeping	2.5.10	Pharmacy uses computer with software for inventory management and medicine use	1	1	1	1	1
2.5.11 Pharmacy Stock Available	2.5.11	Number of items of hospital formulary stocked in pharmacy(less than 50%= 0; 50 70 =1, 70-85=2 85-100= 3)	0	1	1	0	3

2.5.12 Display and Storage of Medicine	2.5.12.1	All the medicines and supplies are displayed in clean racks following either alphabetical orders and generic names or grouping as use	0	1	1	1	1
	2.5.12.2	Temperature of pharmacy is monitored and recorded and is maintained in range of (25+/ 2°C)	1	1	1	0	1
	2.5.12.3	Functional freeze +/-4°C for thermolabile medicine	1	1	1	1	1
2.5.13 Information to Patients	2.5.13.1	Pharmacy department has its allocated separate information and counseling unit with reference books or e-books	0	1	0	0	1
	2.5.13.2	Information regarding the medicines is provided to the patients.	0	1	1	1	1
	2.5.13.3	IEC materials (posters, leaflets, national hospital formulary) about the appropriate use for medicines are available in the pharmacy area.	1	1	1	0	1
2.5.14 Generic Prescription	2.5.14	Hospital has pre-printed list of medicines for generic prescription available	0	1	1	0	1
2.5.15 Dispensing Medicine	2.5.15.1	Medicine is dispensed using electronic billing with barcode system	1	1	1	0	1
	2.5.15.2	Each medicine is given with written instructions on how to take	1	1	1	1	1
2.5.16 First Expiry First Out	2.5.16	FEFO system is maintained using standard stock book/cards.	1	1	1	1	1
2.5.17 Pharmacy Inventory	2,5,17	Every month, all medicines and supplies are counted, out- of-date discarded, and tallied with the medical store.	1	1	1	0	1

2.5.18 Drug Utilization Review and Quantification of Data	2.5.18.1	Pharmacy department operates pharmacovigilance activities and adverse drug reaction (ADR) Reporting	0	1	1	0	1
	2.5.18.2	Pharmacy department conducts studies on drug utilization and quantification	0	0	0	0	1
2.5.19 Pharmaceutical Waste Disposal	2.5.19	Pharmaceutical waste (expired or unused pharmaceutical products, spilled contaminated pharmaceutical products surplus drugs, vaccines or sera, etc) management is done based on HCWM guideline or returned to the supplier on time	0	1	0	0	1
Standard 2.5		**Total Obtained Score**	**19**	**33**	**30**	**15**	**39**
		Total Percentage (Total Obtained Score/39 x100)	**49%**	**85%**	**77%**	**38%**	

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267 **Table 6. MSS assessment of Hospital Pharmacy service (Code 2.5) for Secondary B Hospital**

Components	Code	Standards	Trishuli	Dhading	Bhaktapur	Bakular	Hetauda	Sindhuli	Maximum score
			Obtained Score	Obtained Score	Obtained Score	Obtained Score	Obtained Score	Obtained Score	
2.5.1 Pharmacy unit available	2.5.1	Hospital has designated pharmacy unit	1	1	1	1	1	1	1
2.5.2 Governance committee for hospital pharmacy services	2.5.2.1	Drug and Therapeutic Committee (DTC)	1	1	1	1	1	1	1
	2.5.2.2	Hospital Pharmacy operation committee	1	1	1	1	1	1	1
2.5.3 Hospital Formulary Heading: Availability of medicine and supplies	2.5.3.1	Hospital has prepared formulary list based on Nepalese National Formulary (NNF) approved by DTC	0	1	1	1	1	1	1
	2.5.3.2	Hospital formulary list includes all medicines and supplies as per services provided by hospital	1	1	1	1	1	1	1
	2.5.3.3	Hospital has all, medicines and supplies available as per approved hospital formulary list	1	1	1	1	0	0	1
2.5.4 Good Procurement Practice	2.5.4.1	Annual procurement plan for medicines and supplies for pharmacy services is available	1	0	1	1	1	1	1

	2.5.4.2	Procurement is done based on public procurement guideline	1	1	1	1	1	1	1
	2.5.4.3	Product specification for each medicine and related supplies of approved formulary list is available	0	1	1	1	1	1	1
	2.5.4.4	Technical criteria on quality assurance of procured medicines is included in tender document	1	1	1	1	1	1	1
	2.5.4.5	Certificate of analysis (CoA) from manufacturer of each batch of procured medicine is available	1	1	1	0	1	0	1
	2.5.4.6	Selling price of the drugs does not exceed 20% of the procurement price	1	0	1	1	1	1	1
2.5.5 Pharmacy Services Hours	2.5.5	The pharmacy is open 24x7	1	1	1	1	1	1	1
2.5.6 Staffing as per Hospital Pharmacy Services guideline 2072	2.5.6.1	Pharmacy unit is led by at least one Clinical pharmacist	1	0	1	0	0	1	1
	2.5.6.2	Pharmacy has at least one assistant pharmacist and one office assistants in each shift	1	0	1	0	1	0	1

	2.5.6.3	Duty roster of pharmacy to cover 24 hours service is prepared and visibly placed	1	1	1	1	1	1	1
2.5.7 Display of List of Free Medicine	2.5.7	The list of free medicines is displayed in a clearly visible place.	1	1	1	1	1	1	1
2.5.8 Availability of Medicine for Specific Programs	2.5.8	All of the required medicines and supplies for specific programs are available in pharmacy (less than 50%= 0; 50-70 =1, 70-85=2 85 100= 3)	2	0	3	2	1	1	3
2.5.9 Inpatient Pharmacy Services Available	2.5.9	Hospital pharmacy directly supplies inpatient medicine and supplies to wards and OT	0	0	1	1	0	0	1
2.5.10 Electronic Records Keeping	2.5.10	Pharmacy uses computer with software for inventory management and medicine use	1	1	1	1	1	1	1
2.5.11 Pharmacy Stock Available	2.5.11	Number of items of hospital formulary stocked in pharmacy (less than 50%= 0; 50 70 =1, 70-85=2 85-100= 3)	2	1	3	2	1	2	3

2.5.12 Display and Storage of Medicine	2.5.12.1	All the medicines and supplies are displayed in clean racks following either alphabetical orders and generic names or grouping as use	1	1	1	1	1	1	1
	2.5.12.2	Temperature of pharmacy is monitored and recorded and is maintained in range of (25+/ 2°C)	0	1	1	1	1	0	1
	2.5.12.3	Functional freeze +/- 4°C for thermolabile medicine	1	1	1	1	1	1	1
2.5.13 Information to Patients	2.5.13.1	Pharmacy department has its allocated separate information and counseling unit with reference books or e-books	1	1	1	0	0	0	1
	2.5.13.2	Information regarding the medicines is provided to the patients.	1	1	1	1	1	1	1
	2.5.13.3	IEC materials (posters, 28 leaf lets, national hospital formulary) about the appropriate use for medicines are	0	1	1	1	0	0	1

		available in the pharmacy area.							
2.5.14 Generic Prescription	2.5.14	Hospital has pre-printed list of medicines for generic prescription available	1	1	1	0	1	1	1
2.5.15 Dispensing Medicine	2.5.15.1	Medicine is dispensed using electronic billing with barcode system	1	1	1	1	1	1	1
	2.5.15.2	Each medicine is given with written instructions on how to take	1	1	1	1	1	1	1
2.5.16 First Expiry First Out	2.5.16	FEFO system is maintained using standard stock book/cards.	1	1	1	1	1	1	1
2.5.17 Pharmacy Inventory	2.5.17	Every month, all medicines and supplies are counted, out- of-date discarded, and tallied with the medical store.	1	1	0	1	0	0	1
2.5.18 Drug Utilization Review and Quantification of Data	2.5.18.1	Pharmacy department operates pharmacovigilance activities and adverse drug reaction (ADR) Reporting	1	1	1	1	1	1	1

	2.5.18.2	Pharmacy department conducts studies on drug utilization and quantification	0	0	1	1	0	1	1
	2.5.18.3	Antimicrobial stewardship program, proper antimicrobial utilization review and provide data on microbial use	0	0	1	0	0	0	1
2.5.19 Pharmaceutical Waste Disposal	2.5.19	Pharmaceutical waste (expired or unused pharmaceutical products, spilled contaminated pharmaceutical products surplus drugs, vaccines or sera, etc) management is done based on HCWM guideline 2014 (MoHP) or returned to the supplier on time	1	1	1	1	0	1	1
Standard 2.5		**Total Obtained Score**	**31**	**28**	**39**	**32**	**27**	**28**	**40**
		Total Percentage (Total Obtained Score/40 x100)	**77.50%**	**70.00%**	**97.50%**	**80.00%**	**67.50%**	**70.00%**	

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Discussion

This is a novel study from Nepal that assesses the adherence to hospital pharmacy services through the MSS checklist with a retrospective secondary analysis. With the scarce in the MSS based hospital pharmacy practice research from Nepal [3], this study acts as a robust evidence to pinpoint the minimum standards adherence level to the criteria set out by the Quality Standards and Regulation Division, Ministry of Health and Population, Nepal.

Almost majority of the primary, secondary A, and secondary B hospitals had their own hospital formulary. For all hospitals, the hospital pharmacy service code 2.5 consists of a standard titled "Hospital has prepared formulary list based on Nepalese National Formulary (NNF) approved by DTC". In the context of Nepal, NNF acts as a significant resource tool for developing in house formulary for pharmacists, physicians, and healthcare professionals [21]. The hospital pharmacy must prepare its in-house formulary in response to NNF, amend the comments while formulating it, and approve it via meticulous discussion and consensus within the DTC [3]. Literature also highlights how there is a pertinent gap in the presence of evidence-based guidelines and protocols for formulating, approving, and reviewing the process of hospital formularies [22]. However, it should contain substantial evidence in line with the standard treatment guidelines (STGs) as the process of its development and review should be rational, iterative, and include a multidisciplinary team [22]. The MSS checklist for hospital pharmacy service does not include questions on the number of revisions, and the entire ratification process, thus introducing a major gap in whether the in-built formulary followed the number of revisions and a thorough iterative process, and if it incorporated the STGs.

The majority of the primary and secondary A hospitals did not follow the several codes of standards of good procurement practice. The good procurement practices of the MSS checklist for hospital

pharmacy service code 2.5 includes on the concepts such as annual procurement plan, procurement conducted based on public procurement guideline, presence of the specification for each medicine, technical criteria on quality assurance of procured medicines to be present in the tender document, certificate of analysis (CoA) from the manufacturer of procured medicine and selling price of the medicines not exceeding 20% of the procurement price [18–20]. The Hospital Pharmacy Service guideline 2015, which acts as a cornerstone for the development of hospital pharmacy in the context of Nepal [4] also outlines the provision (Rule 8) for procurement of medicines following the Public Procurement Act 2007 and Public Procurement Rules 2007 [23]. Similarly, Rule 9 of the guidelines also provides a significant step for the pricing of the drug following its procurement, which shall be determined by adding no more than 20% to the cost price. [23].

More than a decade after the release of the Hospital Pharmacy Services Guidelines 2015, significant gaps still persist in meeting the minimum standards of hospital pharmacy services across different tiers of hospitals regarding staffing and human resources, as the status of staffing at different tiers of hospitals was variable. In primary hospitals, *Bajrabarahi Chapagaun* Hospital, Lalitpur and *Tokha Chandeshori* Hospital, Kathmadu were compliant with the guidelines, followed by *Rasuwa* Hospital, *Rasuwa*. In secondary A hospitals, *Chautara* Hospital, *Sindhupalchowk* was compliant with the guidelines, followed by *Methinkot* Hosptial, Kavrepalanchowk, at a poor status. In contrast, *Ramechhap* District Hospital and *Pashupati Chaulagain Smirti* Hospital, *Dolakha*, demonstrated poor compliance, lacking a clinical pharmacist, a pharmacist, and an assistant pharmacist. In secondary B hospitals, *Trishuli* Hospital, *Nuwakot*, and Bhaktapur Hospital, Bhaktapur, were compliant with the guidelines, followed by Hetauda Hospital, Makwanpur, at improving status and Sindhuli Hospital, Sindhuli at an acceptable level. In contrast, *Bakulahar Ratnanagar* Hospital, Chitwan, and *Dhading* Hospital,

315 *Dhading*, demonstrated poor compliance, with the absence of required pharmacy personnel. The
316 hospital pharmacy service guideline 2015 rule 10 has set the minimum number of human resources
317 for the operation of hospital pharmacy services depending upon the number of beds [23]. Hospitals
318 with more than 50 beds to 100 shall have at least one clinical pharmacist, 2 pharmacists, 4 assistant
319 pharmacists, and 2 helpers. Similarly, beds more than 100 shall have at least 1 clinical pharmacist,
320 3 Pharmacists, 6 assistant pharmacists, and 2 helpers [23]. However, pharmacies from Bagmati
321 province were still not totally adhering to the hospital pharmacy service guideline 2015, thus
322 questioning the quality of pharmacy service. This also goes against in contravention to the section
323 28 as outlined by the Drugs Act 1978, where the section prohibits the manufacture, sale,
324 distribution, dispensing or storage without making arrangement of required human resources or
325 resources [24]. Despite literature highlighting the fact that clinical pharmacy services are still
326 evolving in Nepal as the concept is being realized [25], the above lack of resources ultimately halts
327 the pharmaceutical care and medication management therapy [26]. Pharmacies are mainly viewed
328 as business oriented service, hence, ultimately leading to a lack of human resources, further leading
329 to hectic schedules and poor medication management [26].
330 Another component that is not well compliant is the code 2.5.13 “Information to patients” where
331 majority of the pharmacies didn’t have their allocated separate information and counseling unit
332 with reference books or e-books, highlighting the provincial hospital’s poor practice and
333 preference for information dissemination. Literature highlights on how pharmacist can review and
334 perform consultations in a private area, which helps in rigorous exploration of patients views,
335 opinions and experiences along with their knowledge regarding the use of medications [27].
336 Apart from the secondary B hospital, the majority of the primary and secondary A hospitals lacked
337 in standards such as Pharmacovigilance and Adverse drug reaction reporting (ADR) system. This

shows hospitals lack of readiness in incorporating pharmacovigilance services within the system. One example of secondary B hospital, which got its regional pharmacovigilance center from the National Drug Regulatory Authority of Nepal, Department of Drug Administration (DDA), aims to provide pharmacovigilance services in term basis [28]. The reason for such poor integration of pharmacovigilance services might be due to the hospital readiness, lack of information to physicians, hesitancy towards new systems, and lack of skilled human manpower [29]. This also underscores the need for improving the knowledge, attitude, and practice (KAP) among healthcare professionals within the hospital to enhance pharmacovigilance and ADR reporting [29]. With greater than 15 regional pharmacovigilance centers in Nepal, and adequate resources, [30], the provincial hospitals from Bagmati province, without their own pharmacovigilance centre, can form a memorandum of understanding for sharing their documented ADRs report from the validated ADR reporting format provided by DDA [30].

Apart from all Secondary B hospital, both primary and secondary A hospitals were poorly compliant to standard code 2.5.19 Pharmaceutical Waste disposal. A maximum point of one was provided when pharmaceutical waste management was conducted as per the Health Care Waste Management Guideline (HCWM) 2014 or was returned to the supplier within time [18–20]. Under the HCWM 2014 guideline classifies pharmaceutical wastes including cytotoxic agents are classified under the section 3.2.2 Healthcare waste requiring special attention [31]. Within this section, pharmaceutical wastes are further categorized into non-hazardous, potentially hazardous, and hazardous pharmaceutical waste [31]. However, the MSS criteria doesn't specify which form of waste management technique and steps were used for pharmaceutical waste management. Guidelines from high income countries also show how drug products poses an harm to the environment, and pharmacists should play critical roles in improving the management of

pharmaceutical wastes [32]. Literatures also highlights how non adherence, poor, and increased disposal practices of pharmaceutical wastes lead to environmental pollution, along with cases of accidental poisoning, antimicrobial resistance and occupational hazards [33,34].

KAP studies regarding the disposal of expired, unused, unwanted medications among healthcare professionals revealed poor practice and knowledge, underscoring the need for targeted interventions such as pharmacy led take back program, an eco-friendly mechanism with strict adherence to national-level guidelines, supervision, and educational awareness [33,35–37]. Integrating the guideline endorsed by DDA, "Guideline for the Management of Pharmaceutical Waste" [38] could be used in accordance with the HCWM 2014 guideline to facilitate proper disposal of unused, unwanted and expired medications [31].

Implication for Policy practice

Following the findings, the data could be used by hospital settings to help reduce the deficiencies and improve the quality of pharmaceutical services. Integration of the MSS tool with contemporary and timely tools are also required to facilitate time-based surveillance in the pharmaceutical services of Nepal. These findings should help DTC, along with members from the hospital development committee, in formulating a robust action plan to meet the non-compliant sections. For hospitals not meeting the required resources, they could be filled in proper communication with the Ministry of Health, such as human resources, training programs, and continuous professional development regarding MSS compliance.

Strengths and Limitation

This study acts as a first step in analyzing the MSS score with a special focus on hospital pharmacy service using a tool endorsed by the Quality Standards and Regulation Division, Ministry of Health

and Population, Government of Nepal. The study also has limitations. Firstly, the study donot include the hospital executed by local level, thus generating the sampling bias. The findings are from the Bagmati province (one out of the seven); hence it may not be generalizable to all the hospitals from other provinces or to the federally executed hospitals. The study does not have any inferential statistics used to measure the causation between dependent and independent variables. Since, the tools used are the MSS checklist, a strong focus on the variables, including the hospital location (kilometers), access to facilities, barriers and the number of pharmacists, assistant pharmacist and their experiences were not observed.

Conclusions

Out of 13 provincial hospitals analyzed for their MSS based hospital pharmacy services, the seven hospital revealed an acceptance level that requires careful intervention (70 to <85) followed by two hospital pharmacy within very poor and alarming status (<50) that needs to be addressed first, two hospital with improving status (50 to <70) requiring specific targeted areas support and two hospital with optimal level (85 to 100) of readiness to provide the service that require sustained efforts to maintain the level. Despite positive growth in the development of hospital formulary within hospitals, standards such as good procurement practice, staffing, information to patients, pharmacovigilance and ADR reporting, and pharmaceutical waste management were still poorly complaint underscoring the need for integrated approach from the Ministry of Health, hospital development committee, Directorate of Health of the province along with the DTC to fulfil the standards and help in the proper pharmaceutical care continuum.

List of abbreviations

ADR: Adverse Drug Reaction

ASHP: American Society of Health-System Pharmacists

CoA: Certificate of Analysis

DDA: Department of Drug Administration

DTC: Drug and Therapeutic Committee

FEFO: First Expiry First Out

FIP: International Pharmaceutical Federation

FY: Fiscal Year

GPP: Good Pharmacy Practice

GSDP: Good Storage and Distribution Practice

HCWM: Health Care Waste Management Guideline

IRC MBAHS: Institutional Review Committee Madan Bhandari Academy of Health Sciences

KAP: Knowledge, Attitude and Practice

LMIC: Low Middle Income Country

MSS: Minimum Service Standards

NNF: Nepalese National Formulary

STG: Standard Treatment Guideline

USA: United States of America

WHO: World Health Organization

Declarations

Ethics approval and consent to participate

The retrospective data were collected and subsequently analyzed following ethical approval (Approval number: IRC-093-082-83, Reference number: IRC-59) obtained from the Institutional Review Committee – Madan Bhandari Academy of Health (IRC-MBAHS), Bagmati Province, Nepal. Similarly, an approval letter was also obtained from the Ministry of Health, Bagmati Province, Nepal (Reference number 1973). Following research has been conducted following all the norms and standards as outlined in the IRC MBAHS as well as in accordance with the Declaration of Helsinki. Since, the study followed a retrospective secondary analysis of data involving the MSS of hospital pharmacies from province, human participants were not involved. Hence, informed patient consent was not applicable in this case. The consent to participate was waived by the IRC MBAHS.

Consent for publication

Not Applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this article.

Competing interests

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Author's contribution

NP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, writing original draft; **PS**: Data curation, Formal analysis, Writing original draft; **SB**: Data curation, Resources, Software; **PKJ:** Resources, Software; **SK:** Resources, Software; **NN:** Resources, Software; **BR:** Resources, Software

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574 Legends

575 Figure captions

576 Figure 1. MSS Evaluation Process

577 Figure 2. Frequencies and percentages of MSS status of included hospitals