The impact of a Specialist Clinical Pharmacy Services in Paediatric and Neonatal Intensive Care Units in a Tertiary Care Hospital

Aqila Taqi *PhD, MSc Clinical Pharmacy*
Sultan Qaboos University Hospital, Muscat, Oman

Introduction

- Pharmaceutical interventions are actions that identify and prevent medication-related problems (MRP) and optimize patient medication therapy.
- Critically ill children and neonates constitute a special population that is particularly vulnerable to MRP, with multiple risk factors including polypharmacy, long hospital stay and altered pharmacokinetics.
- At Sultan Qaboos University Hospital (SQUH), the impact of specialist clinical pharmacist (CP) services within paediatric and neonatal critical care units was understudied.

Aims and Objectives

- To analyse the documented CP interventions and describe their types, acceptance rate, clinical significance and the grading of clinical significance at SQUH.

Method

- **Design:** A retrospective analysis of the CP interventions over six months between June and December 2023
- **Setting**: A tertiary care teaching institution with a newly renovated paediatric and neonatal intensive care units included four and 18 beds, respectively. CP interventions are recorded on a specific form within the electronic patient record (Figure 5).
- **Study measures** included: types and outcomes of the interventions, the clinical significance and its grading.

Results

- A total of 170 CP interventions were retrieved during the study period, out of which two were excluded due to incompleteness.
- The majority of interventions (98%) were accepted by the treating practitioners (Table 1)
- The most common type of CP interventions was dosage adjustment (3%), followed by frequency (12.5%) (Figure 1).
- Treatment efficacy was enhanced in 44% and toxicity risk was minimised in 39%, while in 14% of the interventions unnecessary exposure was avoided (Figure 2&3).

Table 1: Practitioners Involved in Resolving the Drug Related Problems

Practitioners' designation	Frequency (N=168)
Consultant	30
Specialist	100
Resident	21
Specialist/staff Nurse	10
Not known	6

- In 9% of the interventions a suboptimal standard of care was practice was avoided. However, 76% of the interventions were of moderate and 22% were of minor while 2% were of major clinical significance (Figure 4).

Discussion and Conclusion

- There was an overall positive clinical impact of clinical pharmacists' services in critical care settings. Our findings are consistent with those reported in previous studies conducted in similar settings.
- One third of the interventions involved a single drug class namely systemic antimicrobials, and dose adjustment was the most common type of interventions. This was in line with results reported in a previous research (1).

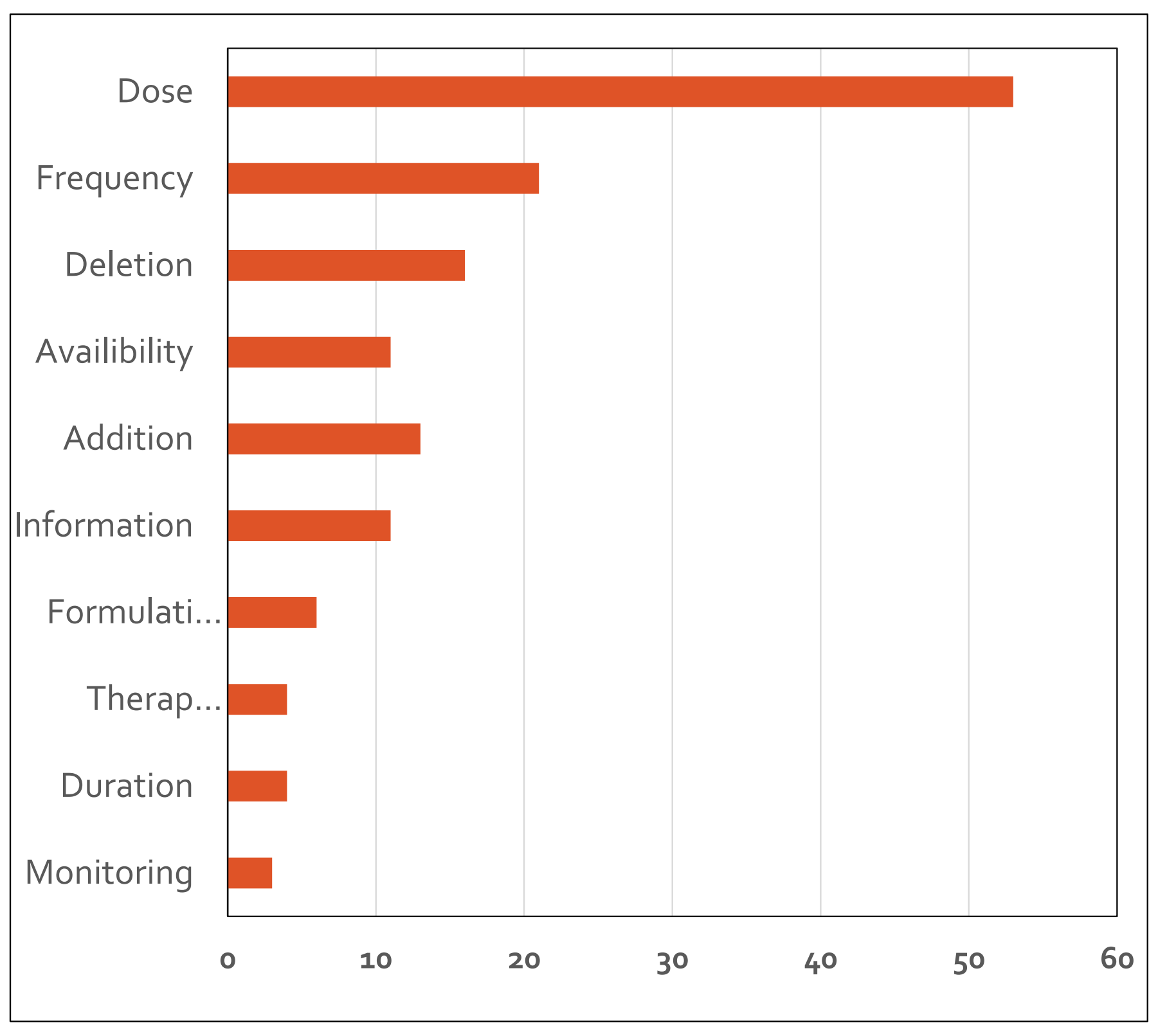


Fig.1:Types of CP Interventions

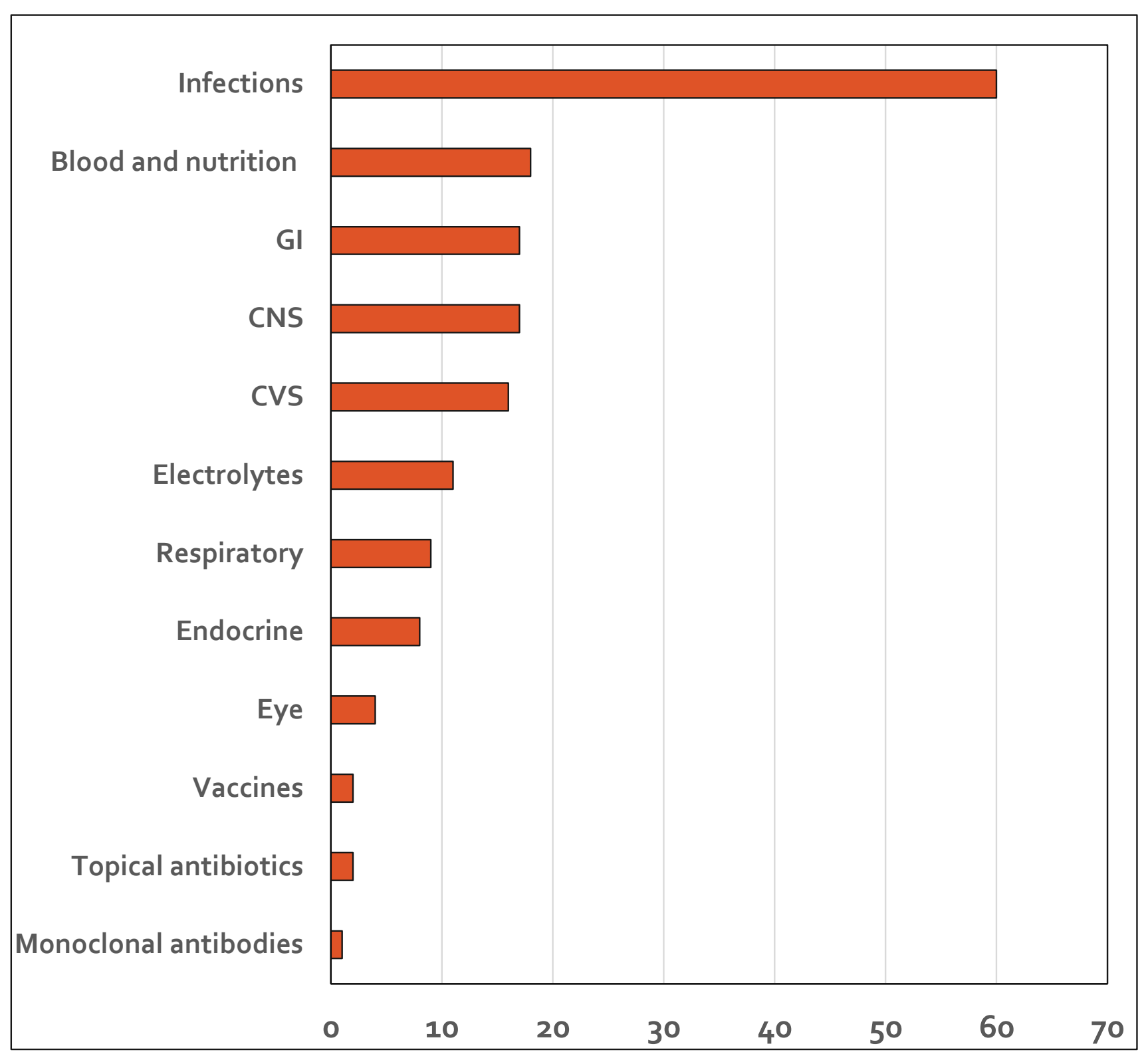


Fig 2: Drug Classes in CP Interventions

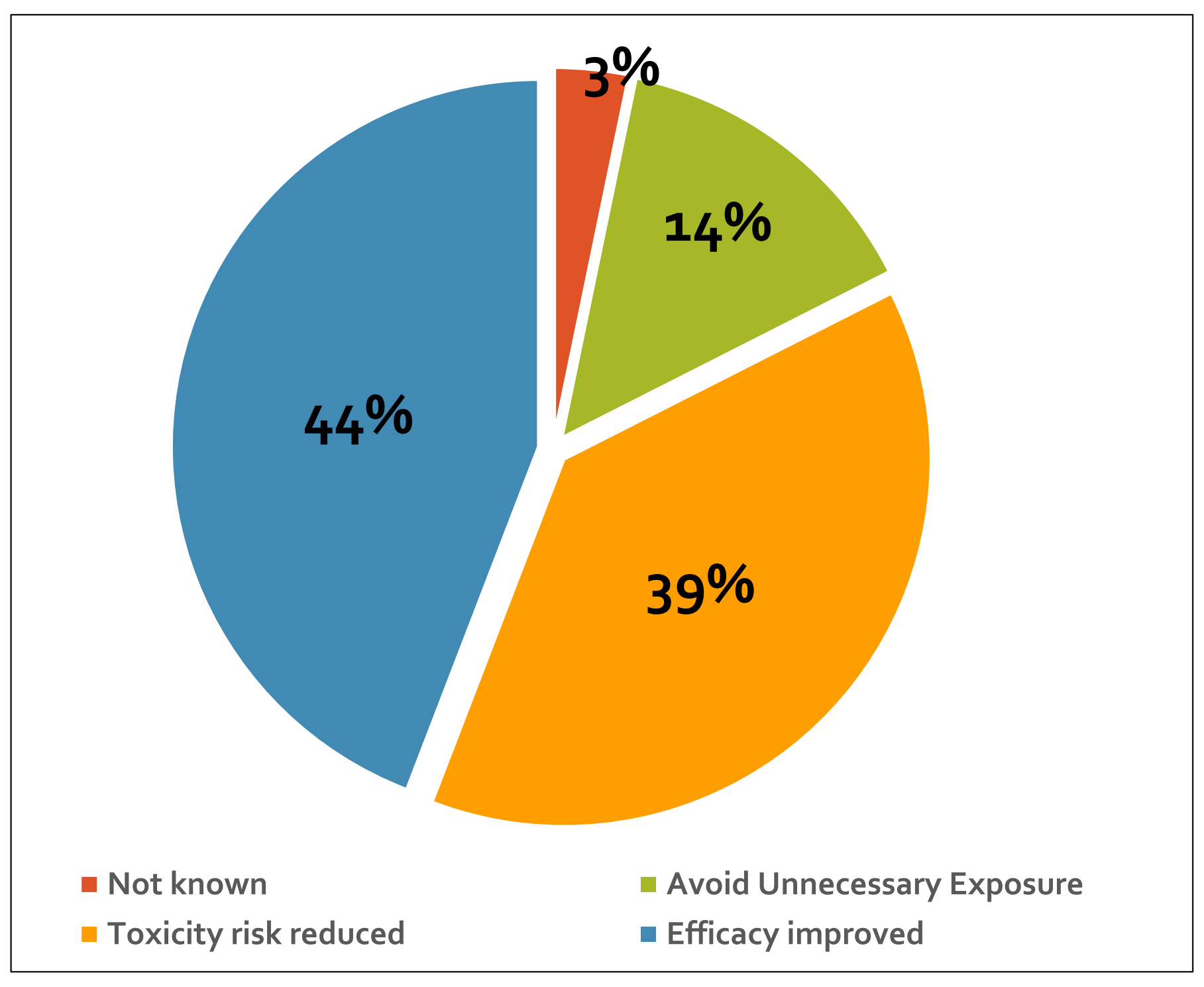


Fig.3:Clinical Significance of CP Interventions

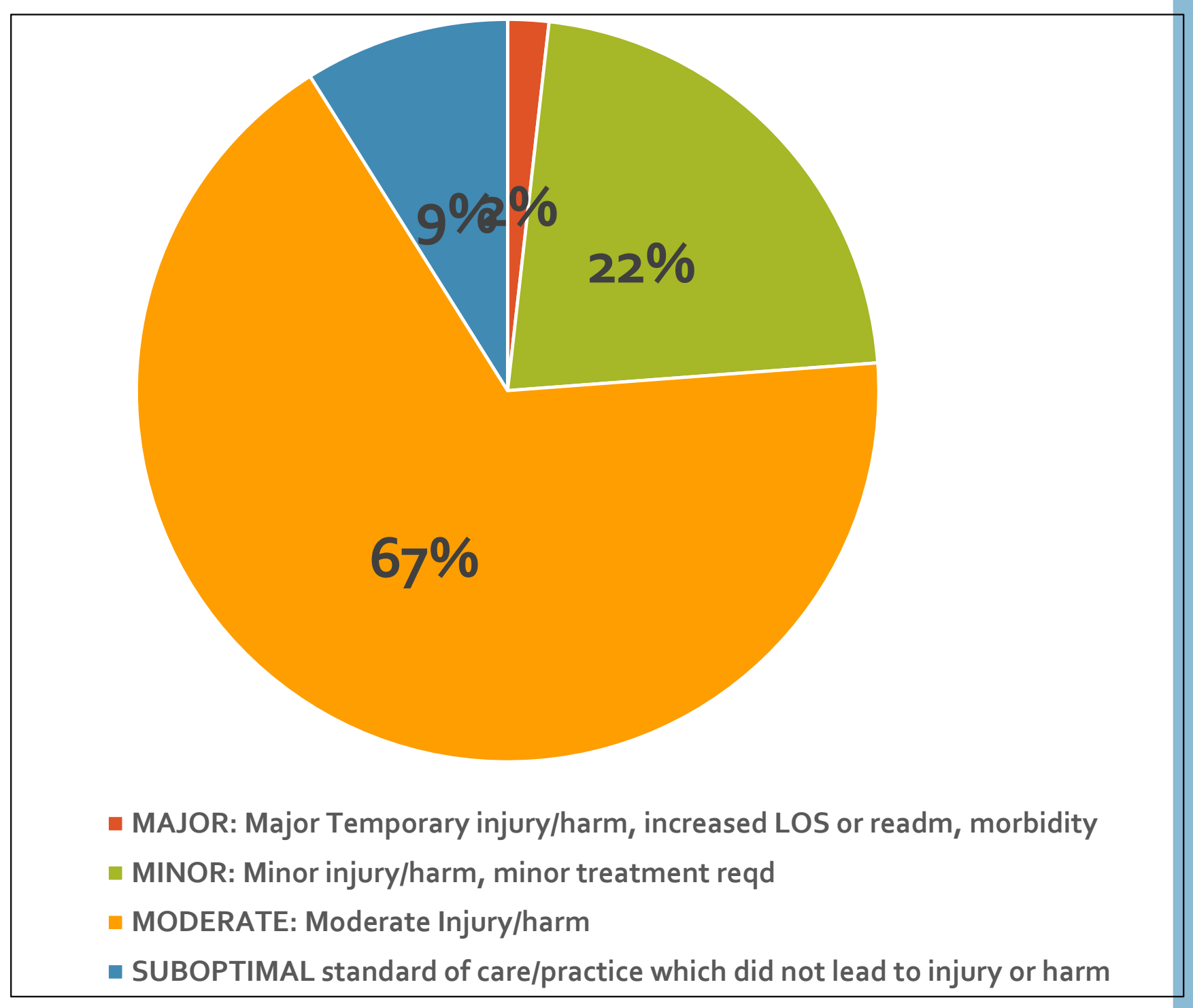
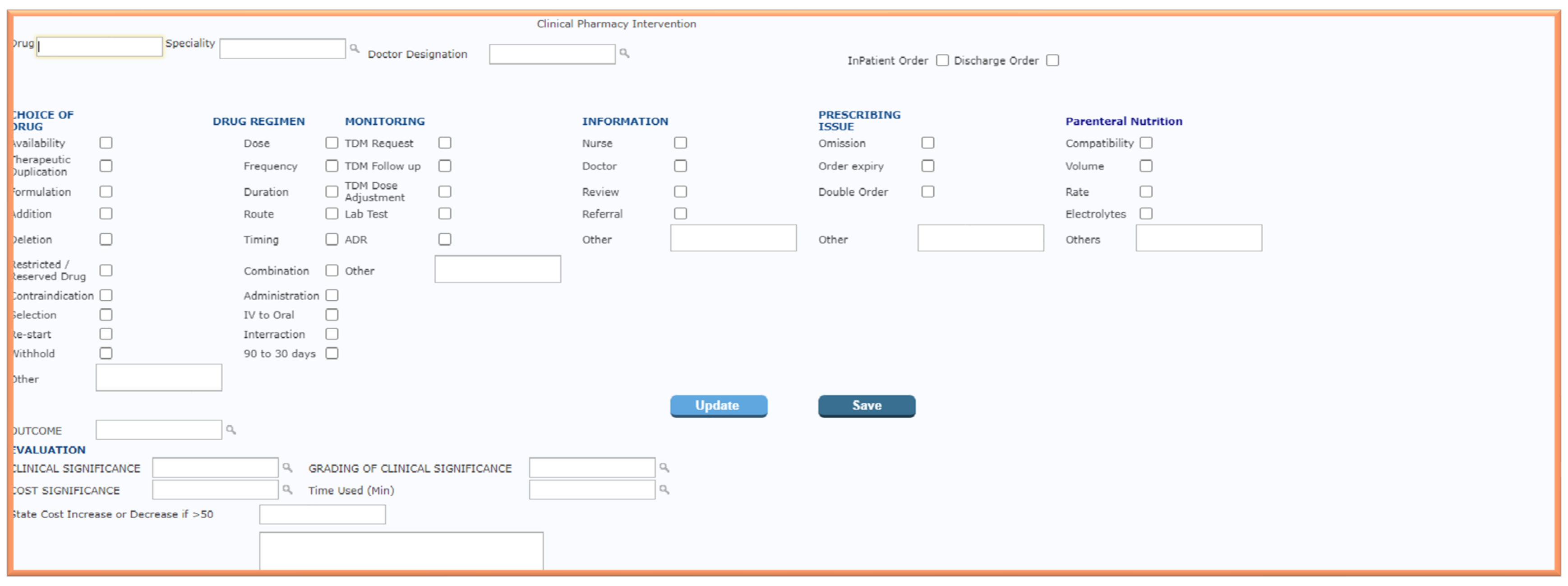


Fig.4: Grading of Clinical Significance



Clinical Pharmacy Intervention

rug ___ Speciality ___ Doctor Designation ___

InPatient Order ☐ Discharge Order ☐

HOICE OF RUG
- vailability ☐
- herapeutic Duplication ☐
- ormulation ☐
- ddition ☐
- eletion ☐
- estricted / eserved Drug ☐
- ontraindication ☐
- election ☐
- e-start ☐
- ithhold ☐
- ther ___

DRUG REGIMEN
- Dose ☐
- Frequency ☐
- Duration ☐
- Route ☐
- Timing ☐
- Combination ☐
- Administration ☐
- IV to Oral ☐
- Interraction ☐
- 90 to 30 days ☐

MONITORING
- TDM Request ☐
- TDM Follow up ☐
- TDM Dose Adjustment ☐
- Lab Test ☐
- ADR ☐
- Other ___

INFORMATION
- Nurse ☐
- Doctor ☐
- Review ☐
- Referral ☐
- Other ___

PRESCRIBING ISSUE
- Omission ☐
- Order expiry ☐
- Double Order ☐
- Other ___

Parenteral Nutrition
- Compatibility ☐
- Volume ☐
- Rate ☐
- Electrolytes ☐
- Others ___

UTCOME ___

VALUATION

LINICAL SIGNIFICANCE ___ GRADING OF CLINICAL SIGNIFICANCE ___

OST SIGNIFICANCE ___ Time Used (Min) ___

tate Cost Increase or Decrease if >50 ___

Fig 5: Electronic Clinical Pharmacists' Intervention Form

References:

1. Salman B. Clinical and Cost Implications of Clinical Pharmacist Interventions on Antimicrobial Use at Sultan Qaboos University Hospital in Oman. Int J Infect Dis. 2021 Aug;109:137-141. doi: 10.1016/j.ijid.2021.07.002. Epub 2021 Jul 7. PMID: 34242762.
2. Tripathi S, Crabtree HM, Fryer KR, Graner KK, Arteaga GM. Impact of Clinical Pharmaciston the Pediatric Intensive Care Practice: An 11-Year Tertiary Center Experience. J Pediatr Pharmacol Ther. 2015;20(4):290-298. doi:10.5863/1551-6776-20.4.290

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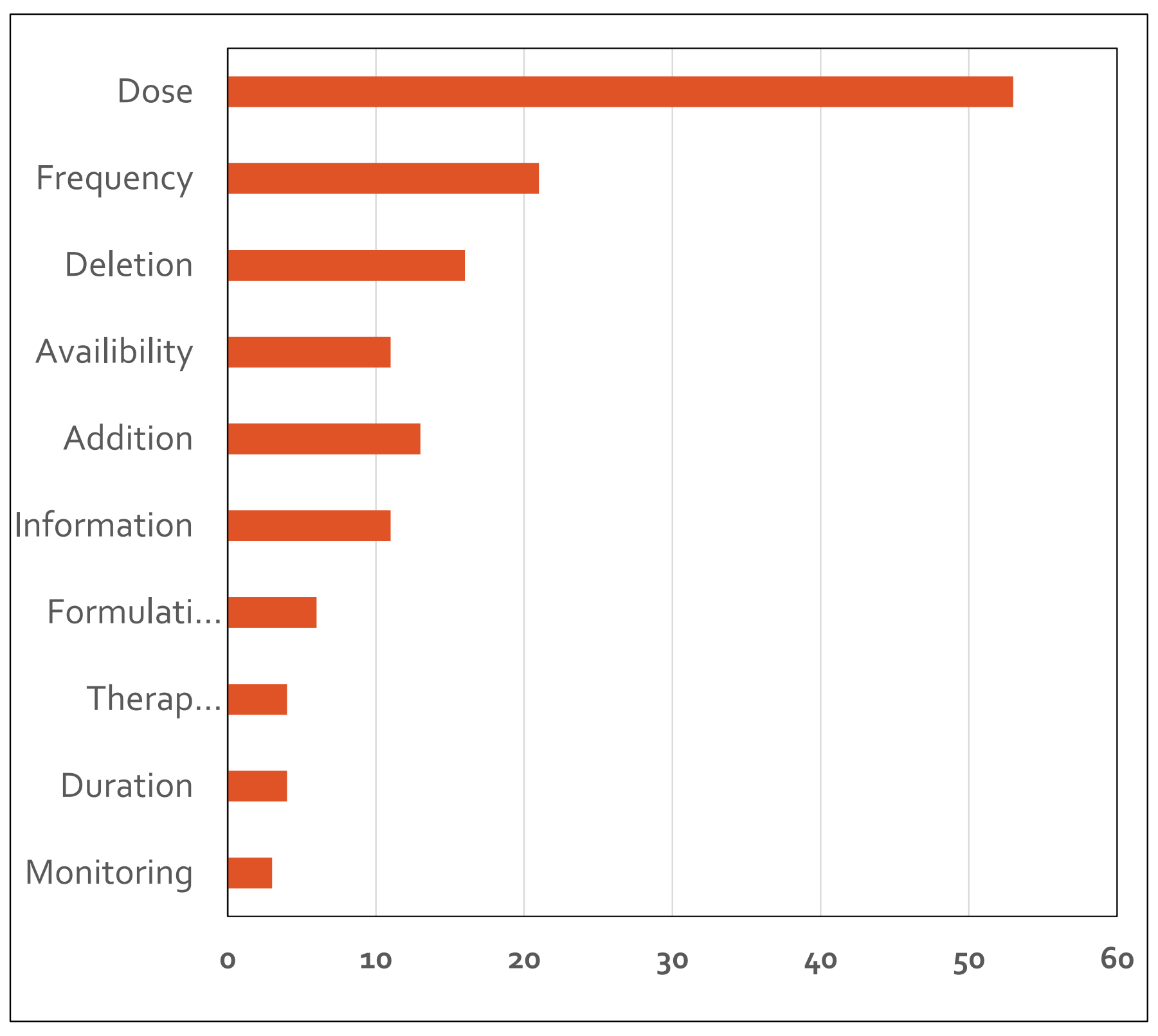

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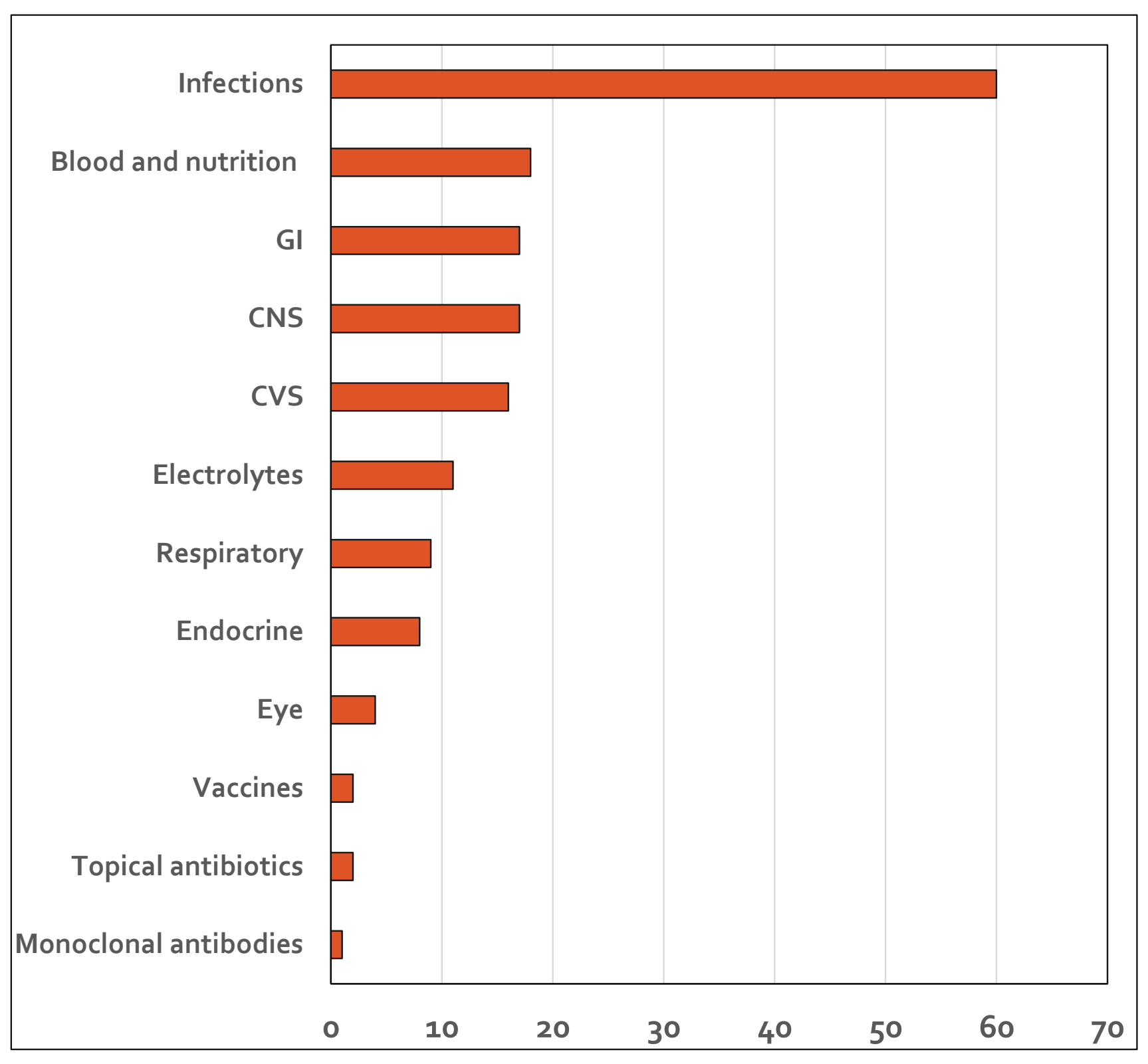

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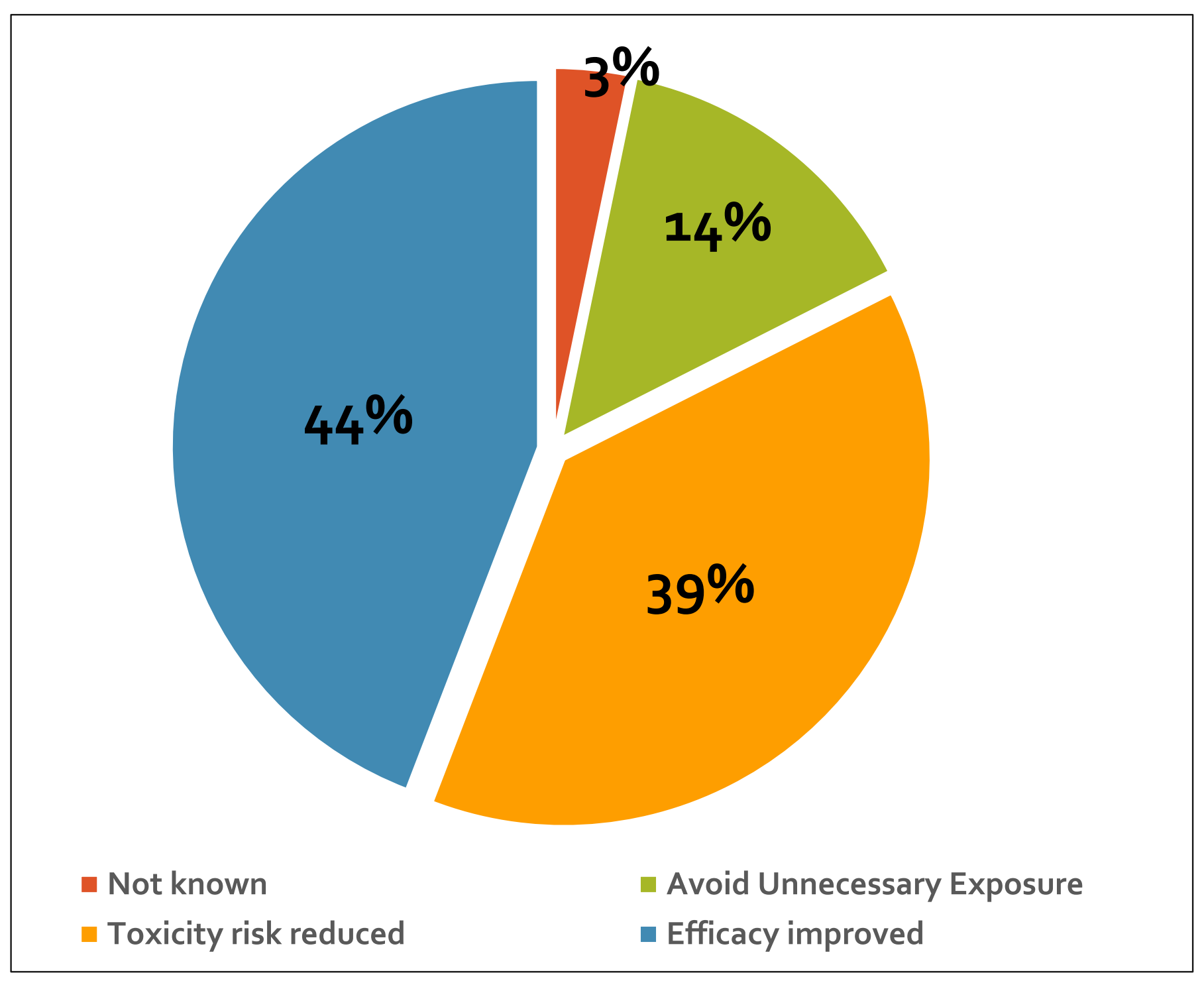

Fig.3:Clinical Significance of CP Interventions

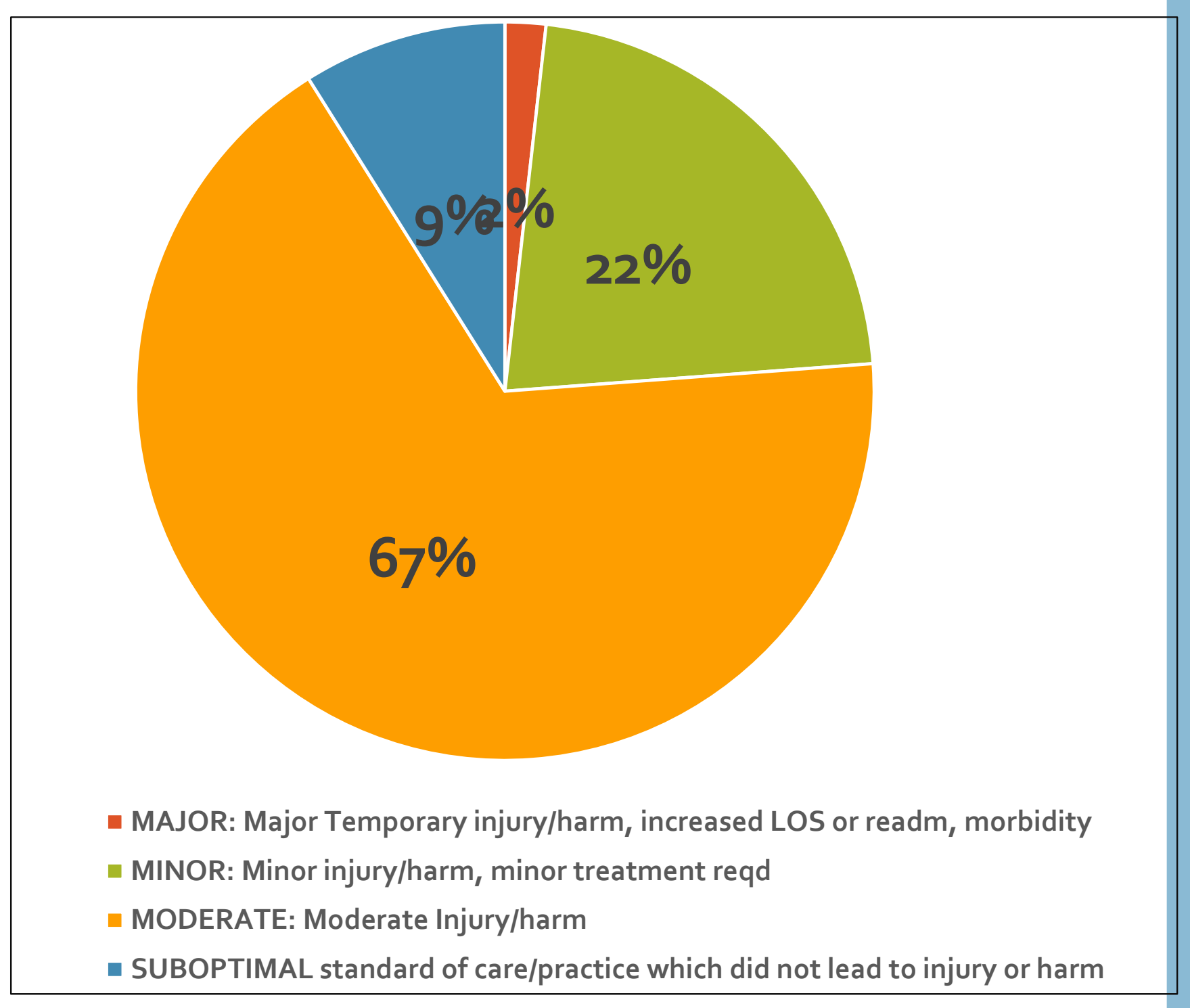

Fig.4: Grading of Clinical Significance

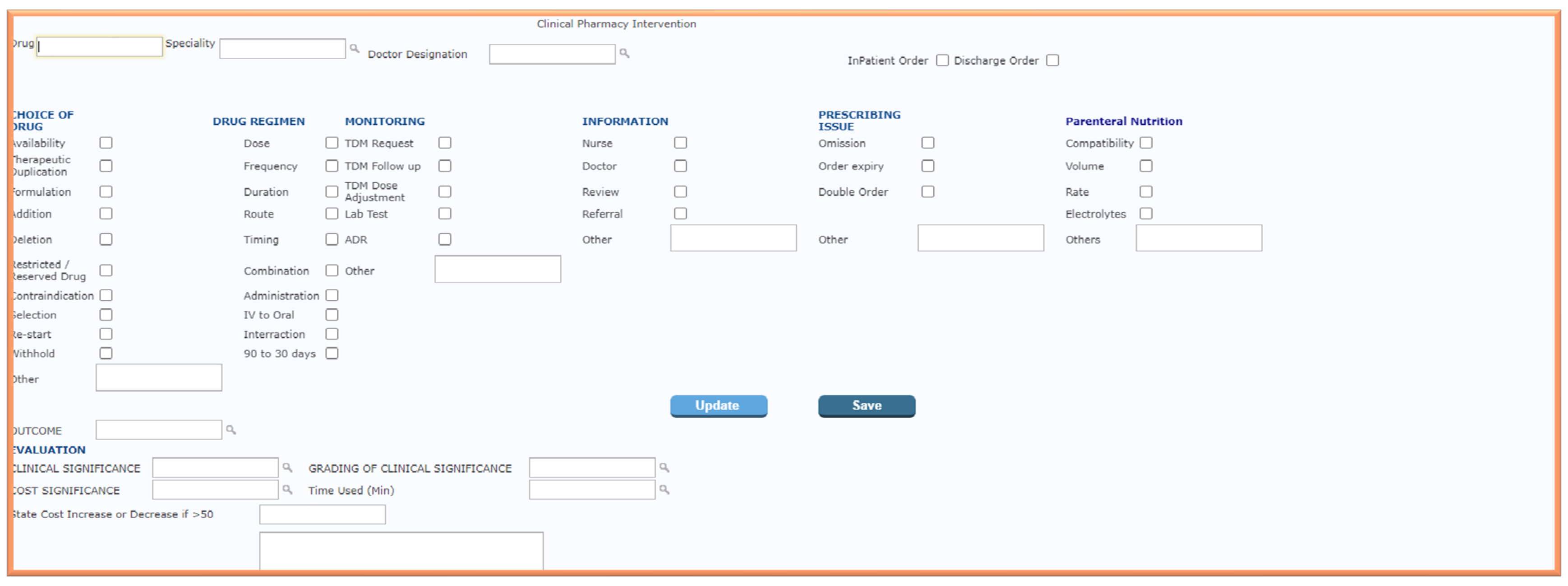

Fig 5: Electronic Clinical Pharmacists' Intervention Form

References:

1. Salman B. Clinical and Cost Implications of Clinical Pharmacist Interventions on Antimicrobial Use at Sultan Qaboos University Hospital in Oman. Int J Infect Dis. 2021 Aug;109:137-141. doi: 10.1016/j.ijid.2021.07.002. Epub 2021 Jul 7. PMID: 34242762.
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Measuring the Administrative Impact of a Specialist Clinical Pharmacist at Neonatal Intensive Care Unit of a Tertiary Care Hospital in Oman using Key Performance Indicators

4CPS-317

Aqila Taqi *PhD, MSc Clinical Pharmacy*
Sultan Qaboos University Hospital, Oman

Introduction

- The neonatal intensive care unit (NICU) is a high-risk environment where medication management requires precision, evidence-based protocols and interdisciplinary collaboration
- The integration of clinical pharmacists into the NICU team has been shown to optimize pharmacotherapy and improve therapeutic outcomes, however, their administrative impact is not well described.
- At SQUH, specialist clinical pharmacists provide pharmaceutical care plans for patients in intensive care settings including NICU

Aims and Objectives

- To measure the administrative impact of specialist clinical pharmacist through the application of defined key performance indicators (KPIs) that reflect contribution beyond direct patient care.

Method

- **Design:** A retrospective review of pharmacist led initiatives over a period of 18 months (Jan 2024 to Jun 2025) was conducted using targeted KPIs.
- These KPIs were selected based on existing SQUH pharmacy practice standards adopted from international standards including ASHP and ISMP recommendations.
- Data across five administrative domains: formulary additions, guideline development, staff education, pharmacovigilance and Respiratory Syncytial Virus (RSV) prophylaxis planning were captured.
- Data were collected from pharmacy & therapeutics committee records and electronic patient records (EPR).

- **Setting**: This study took place at Sultan Qaboos University hospital (SQUH), a tertiary care referral institution in Muscat, with a 24-bed NICU.

- **Data Analysis:** Descriptive statistics (frequencies and percentages) were used to analyze KPI metrics.

Results

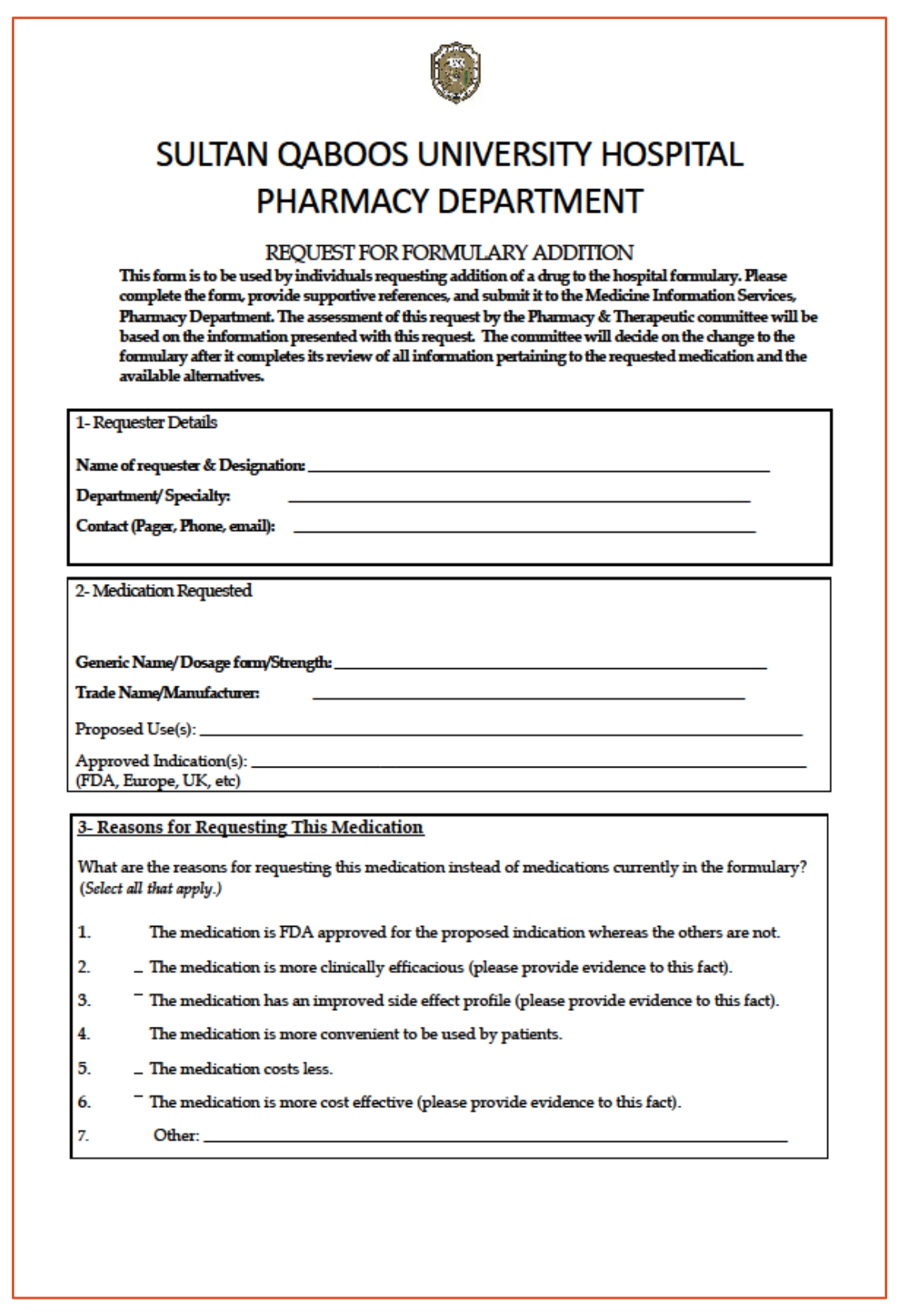
- Five new key neonatal medications were added to formulary including: probiotics (Proprems® powder sachets), oral glucose gel (40% dextrose), bumetanide (injectable solution), sirolimus oral solution and ready to use (ready-mix) standardized total parenteral nutrition (TPN) solutions

- The pharmacist teamed up with neonatology consultants to set indications and eligibility criteria, quantities to order and cost effectiveness of each of the above added medications in preparation for seeking formulary addition and approval by pharmacy and therapeutic committee.

- Six neonatal clinical guidelines were developed during the study; Antiretroviral prophylaxis in neonates born to HIV positive mothers, Probiotics prescribing and administration, Screening prevention and management of hypoglycemia in neonates, Inhaled budesonide in preterm neonates, Fluconazole prophylaxis in neonates and TPN administration guide.
- Twenty adverse Drug reactions (ADRs) detection and documentation, primarily involving caffeine (N=4, 20%), and fluconazole (N=2, 10%)
- The pharmacist coordinated RSV prophylaxis protected 152 at risk infants during the RSV seasons, and enabled accurate forecasting of palivizumab requirements for the next season with 10% estimation margins.
- A structured course on parenteral nutrition was designed and delivered, with pre- and post-course assessments showing an increase in knowledge scores in 88%, and improved confidence in TPN management in 96% of the participants (N=57).

Discussion and Conclusion

- Published studies highlight that pharmacists' roles beyond the regular scope of practice included involvement in immunization programs, staff education and research (1)
- Integration of a specialist clinical pharmacist into NICU formulary management led to measurable improvements in medication safety, clinical guideline development, and multidisciplinary education (2)
- These findings support the expansion of pharmacist roles in formulary governance and quality improvement within NICU settings (3).



SULTAN QAOBOS UNIVERSITY HOSPITAL
PHARMACY DEPARTMENT

REQUEST FOR FORMULARY ADDITION

This form is to be used by individuals requesting addition of a drug to the hospital formulary. Please complete the form, provide supportive references, and submit it to the Medicine Information Services, Pharmacy Department. The assessment of this request by the Pharmacy & Therapeutic committee will be based on the information presented with this request. The committee will decide on the change to the formulary after it completes its review of all information pertaining to the requested medication and the available alternatives.

1- Requester Details

Name of requester & Designation: ____________
Department/ Specialty: ____________
Contact (Pager, Phone, email): ____________

2- Medication Requested

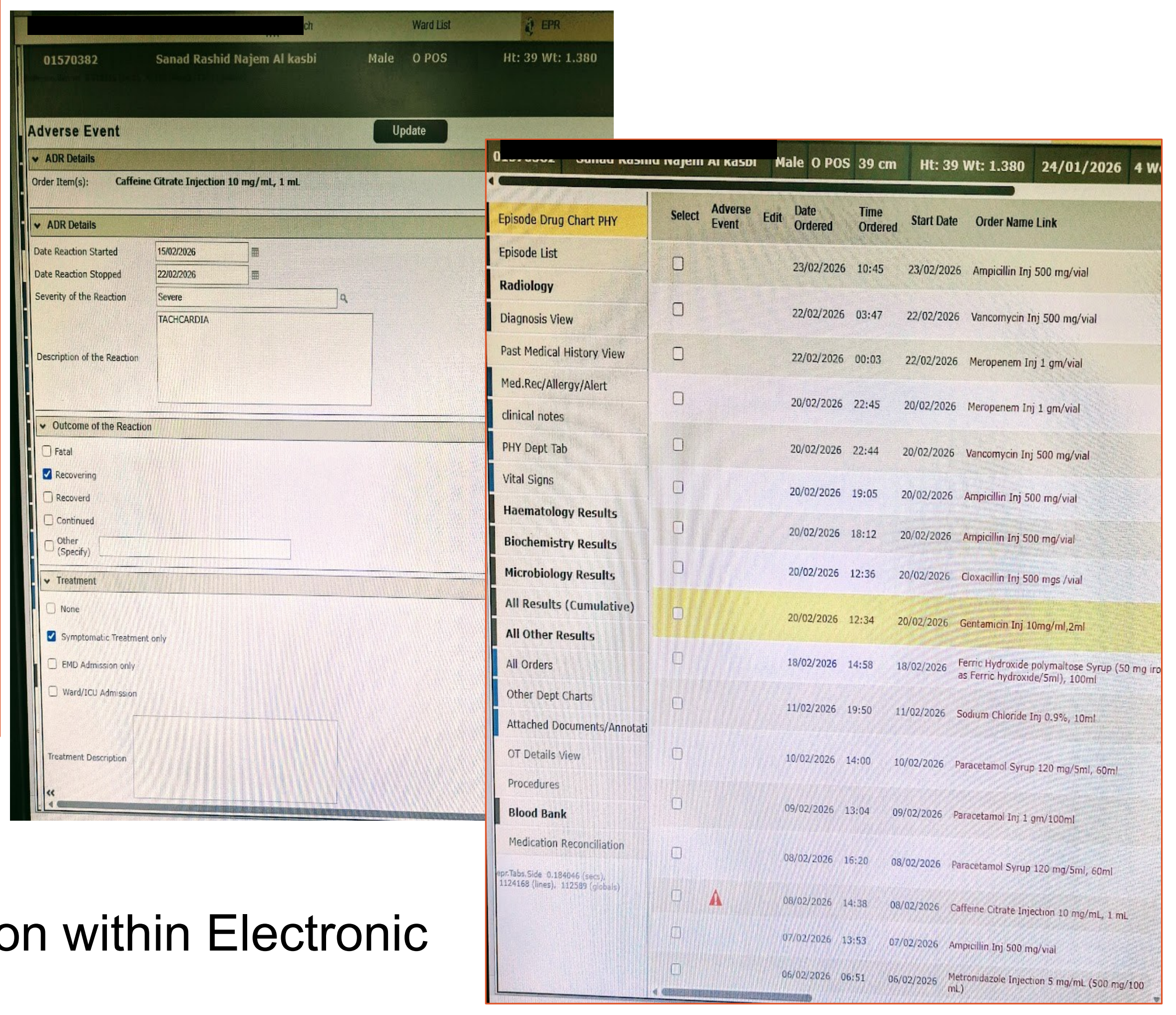
Generic Name/ Dosage form/Strength: ____________
Trade Name/Manufacturer: ____________
Proposed Use(s): ____________
Approved Indication(s): ____________
(FDA, Europe, UK, etc)

3- Reasons for Requesting This Medication

What are the reasons for requesting this medication instead of medications currently in the formulary? (*Select all that apply.*)

1. The medication is FDA approved for the proposed indication whereas the others are not.
2. _ The medication is more clinically efficacious (please provide evidence to this fact).
3. ‾ The medication has an improved side effect profile (please provide evidence to this fact).
4. The medication is more convenient to be used by patients.
5. _ The medication costs less.
6. ‾ The medication is more cost effective (please provide evidence to this fact).
7. Other: ____________

Fig 1: Addition to Hospital Formulary form



[redacted] ch Ward List EPR

01570382 Sanad Rashid Najem Al kasbi Male O POS Ht: 39 Wt: 1.380

Adverse Event

ADR Details

Order Item(s): Caffeine Citrate Injection 10 mg/mL, 1 mL

ADR Details

Date Reaction Started: 15/02/2026
Date Reaction Stopped: 22/02/2026
Severity of the Reaction: Severe
Description of the Reaction: TACHCARDIA

Outcome of the Reaction

☐ Fatal
☑ Recovering
☐ Recoverd
☐ Continued
☐ Other (Specify)

Treatment

☐ None
☑ Symptomatic Treatment only
☐ EMD Admission only
☐ Ward/ICU Admission

Treatment Description

[redacted] Male O POS 39 cm Ht: 39 Wt: 1.380 24/01/2026 4 W

Select	Adverse Event	Edit	Date Ordered	Time Ordered	Start Date	Order Name Link
☐			23/02/2026	10:45	23/02/2026	Ampicillin Inj 500 mg/vial
☐			22/02/2026	03:47	22/02/2026	Vancomycin Inj 500 mg/vial
☐			22/02/2026	00:03	22/02/2026	Meropenem Inj 1 gm/vial
☐			20/02/2026	22:45	20/02/2026	Meropenem Inj 1 gm/vial
☐			20/02/2026	22:44	20/02/2026	Vancomycin Inj 500 mg/vial
☐			20/02/2026	19:05	20/02/2026	Ampicillin Inj 500 mg/vial
☐			20/02/2026	18:12	20/02/2026	Ampicillin Inj 500 mg/vial
☐			20/02/2026	12:36	20/02/2026	Cloxacillin Inj 500 mgs /vial
☐			20/02/2026	12:34	20/02/2026	Gentamicin Inj 10mg/ml,2ml
☐			18/02/2026	14:58	18/02/2026	Ferric Hydroxide polymaltose Syrup (50 mg iro as Ferric hydroxide/5ml), 100ml
☐			11/02/2026	19:50	11/02/2026	Sodium Chloride Inj 0.9%, 10ml
☐			10/02/2026	14:00	10/02/2026	Paracetamol Syrup 120 mg/5ml, 60ml
☐			09/02/2026	13:04	09/02/2026	Paracetamol Inj 1 gm/100ml
☐			08/02/2026	16:20	08/02/2026	Paracetamol Syrup 120 mg/5ml, 60ml
☐	⚠		08/02/2026	14:38	08/02/2026	Caffeine Citrate Injection 10 mg/mL, 1 mL
☐			07/02/2026	13:53	07/02/2026	Ampicillin Inj 500 mg/vial
☐			06/02/2026	06:51	06/02/2026	Metronidazole Injection 5 mg/mL (500 mg/100 mL)

Fig 2: ADR Documentation within Electronic Patient Record

References:

1. Krzyzaniak N, Bajorek B. A global perspective of the roles of the pharmacist in the NICU. Int J Pharm Pract. 2017 Apr;25(2):107-120. doi: 10.1111/ijpp.12284. Epub 2016 Jun 21. PMID: 27324459.
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3. Krzyżaniak N, Pawłowska I, Bajorek B. Quality pharmacy services and key performance indicators in Polish NICUs: a Delphi approach. Int J Clin Pharm. 2018 Jun;40(3):533-542. doi: 10.1007/s11096-018-0623-y. Epub 2018 Mar 31. PMID: 29605949

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