A failure mode effect analysis pre-post implementation of an electronic medication administration record

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INTRODUCTION

To assess risks of drug use prossess => we used a **F**ailure **M**ode **E**ffect **A**nalysis

Manually printed medication administration record (MAR)

Electronic medication administration record (eMAR)

?

Medication errors

OBJECTIVES

To conduct a failure mode effect analysis pre-post implementation of an eMAR

METHODS

- Prospective descriptive study conducted in a 500-bed mother-child teaching hospital
- Production of an Ishikawa diagram associated with the documentation of drug doses
  - ⇒ By research team: composed of four members
  - ⇒ Contains 26 failures modes grouped in six categories
- Establishement of scores rating
  - ⇒ Occurence rating scores
  - ⇒ Detection rating scores
  - ⇒ Severity rating scores

  } Adapted from published data
- Production of a FMEA
  - ⇒ By an expert panel: three pharmacists and four nurses exposed to both MAR and eMAR
  - ⇒ During 90 minutes
  - ⇒ To assess occurrence and detection ratings
  - ⇒ Severity was scored a posteriori by the research team
- Pre-post individual and average criticality indexes (CI) per group (pharmacist and nurses) were calculated
- Convergence when risk reduction ratio of pre/post CI per group were in the same direction were evaluated

$$\text{Risk Reduction Ratio (RRR)} = \frac{\text{CI pre}}{\text{CI* post}}$$

RESULTS

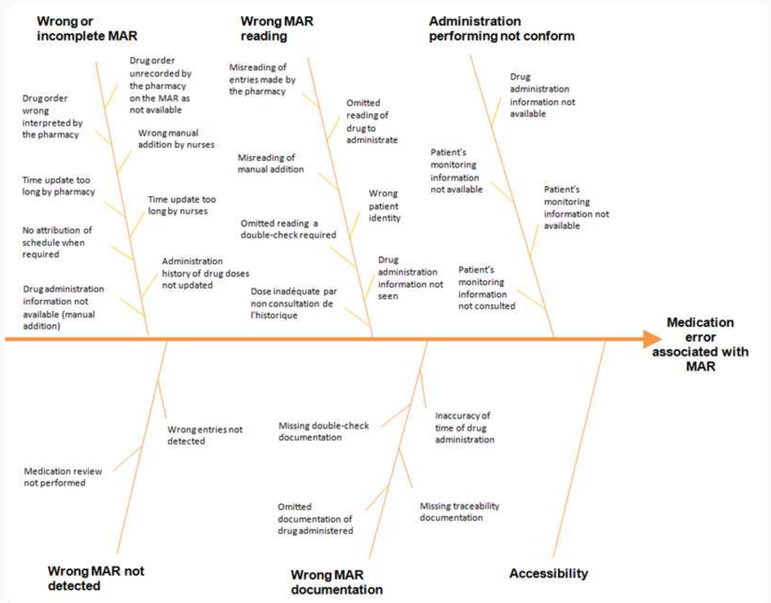


Figure 1. Ishikawa diagram of failure mode of drug dose documentation

- Average CI were reduced from 3084 pre-eMAR to 1905 post-eMAR (1.6 times reduction)
- Risk Reduction Ratio were convergent between pharmacists and nurses for **62%** (16/26) of the failure mode
- Most important risk reduction perceived for nurses were
  - Missing double-check documentation (ratio of 9.1)
  - Missing traceability documentation (5.8)
  - Missing double-check action (3.4)
  - Wrong patient identity (3.3)
  - Missing drug administration information (2.1)
  - Missing drug dose administered (2.0)

	CI	
	Pre eMAR	**Post eMAR**
Mean	3084	1905
Pharmacist	4572	1910
Nurses	2180	1913

Table 1. FMEA and risk reduction ratio results

MAR administration process	Failure modes	Total Pre CI	Total Post CI*	PH Pre CI	PH Post CI*	NUR Pre CI	NUR Post CI*	RRR total	RRR PH	RRR NUR
Wrong or incomplete MAR	Drug order unrecorded by the pharmacy on the MAR as not available	123	115	128	110	117	117	1.08	1.16	1.00
	Drug order wrong interpreted by the pharmacy	105	80	101	76	105	83	1.31	1.33	1.27
	Wrong manual addition by nurses	91	82	144	108	57	64	1.11	1.33	0.89
	Time update too long by pharmacy	116	88	120	96	113	83	1.31	1.25	1.36
	Time update too long by nurses	151	152	140	108	155	189	0.99	1.30	0.82
	No attribution of schedule when required	100	140	114	114	90	159	0.72	1.00	0.56
	Administration history of drug doses not updated	210	147	266	156	173	141	1.43	1.71	1.23
	drug administration information not available (manual addition)	92	73	70	36	107	105	1.26	1.94	1.02
Wrong MAR not detected	Medication review not performed	110	57	180	51	68	56	1.95	3.51	1.21
	Wrong entries not detected	110	82	203	95	58	72	1.35	2.13	0.80
Wrong MAR reading	Misreading of entries made by the pharmacy	102	64	168	73	63	58	1.59	2.29	1.10
	Misreading of manual addition	102	59	190	81	54	45	1.72	2.36	1.18
	Omitted reading of drug to administrate	75	96	88	51	64	138	0.78	1.71	0.46
	Omitted reading a double-check required	82	19	128	20	54	16	**4.36**	6.40	3.40
	Wrong patient identity	46	24	48	37	45	14	1.97	1.29	3.33
	Inadequate drug dose by no consultation of drug administration history (included generic)	64	51	140	42	26	58	1.27	3.33	0.45
	Drug administration information not seen	76	54	117	60	49	50	1.41	1.96	0.98
Wrong MAR documentation	Omitted documentation of drug administered	113	69	160	113	78	39	1.65	1.42	1.98
	Missing traceability documentation	196	22	320	20	121	21	**8.88**	16.00	5.75
	Missing double-check documentation	174	12	312	14	96	11	**14.48**	22.29	9.11
	Inaccuracy of time of drug administration	203	118	333	84	126	135	1.72	3.97	0.93
Administration performing not conform	Drug administration information not available	131	43	227	60	68	32	**3.05**	3.78	2.14
	Drug administration information not consulted	168	84	293	110	95	68	1.99	2.67	1.40
	Patient's monitoring information not available	141	56	227	60	90	54	**2.50**	3.78	1.68
	Patient's monitoring information not consulted	153	91	293	110	77	78	1.68	2.67	0.98
MAR availability	Accessibility	48	28	61	24	34	30	1.76	2.56	1.14

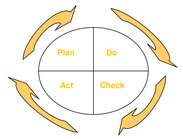
Legend: *RRR: Reduction risk ratio*
RRR>1 = Diminution of criticality indexes post implementation
RRR=1 = Criticality indexes was the same pre and post implementation
RRR>1 = Increasing of criticality indexes post implementation
PH: pharmacist
NUR: nurses
CI: Criticality Indexes in pre
CI: Criticality indexes in post*

CONCLUSION

FMEA

- is very useful to assess risk of drug process
- can help to identify the main failure mode

→ Risk identification



eMAR

- was associated with a **1.6 time risk reduction** by a panel of seven experts
- risks associated with MAR was perceived higher by pharmacists than nurses

→ Optimisation of administration and documentation drug process identification

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