

AIM

Global Aim: Reduce procedural Anesthesia exposure in NICU patients
SMART Aim: Decrease sedated MRI in non intubated patient to zero in year

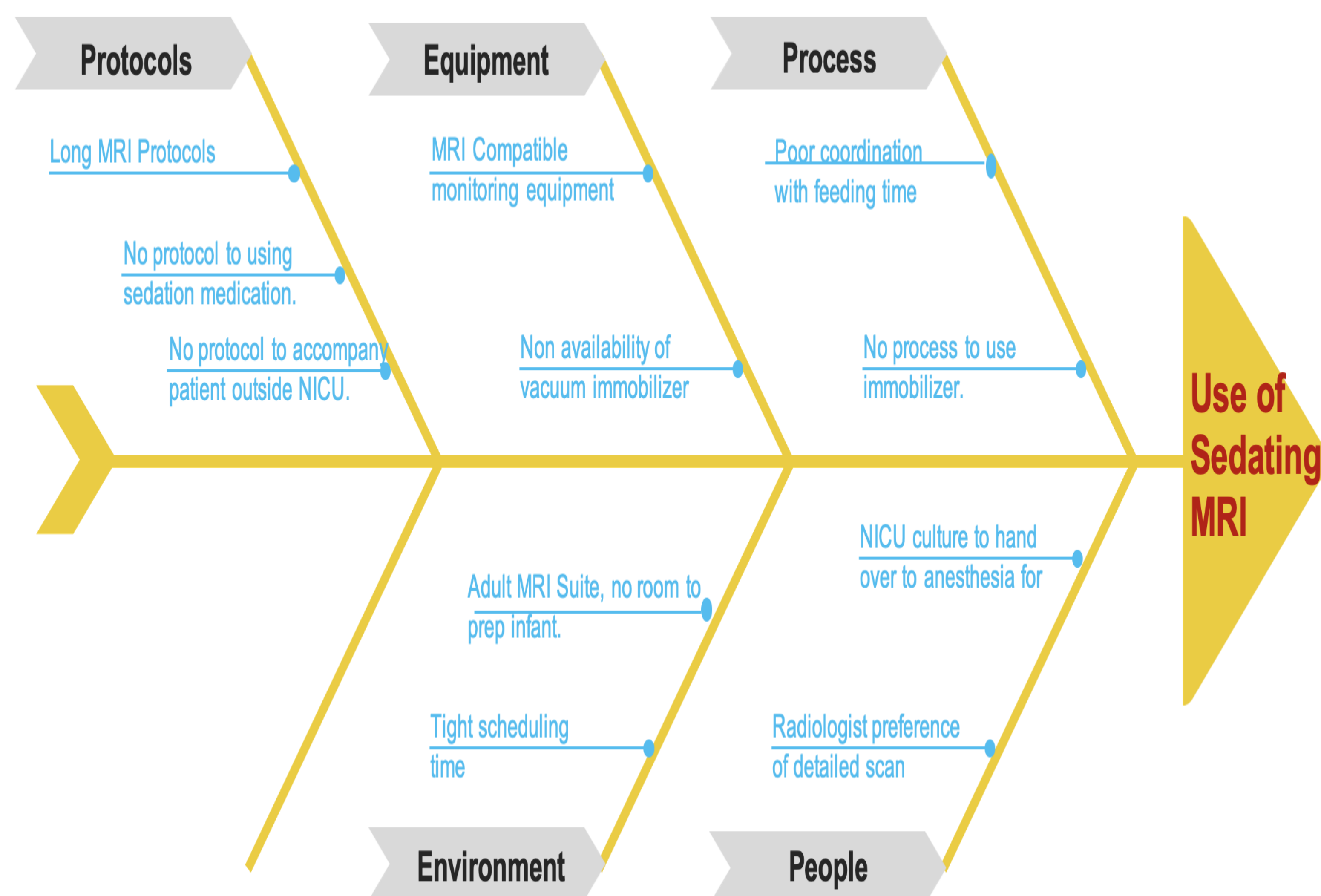
BACKGROUND

- Obtaining high-quality diagnostic imaging requires the patient to lie motionless for an extended period of time.
- The use of sedatives and analgesics or any neurotoxins during this critical period of susceptibility and growth could change the brain morphology and even impair brain connectivity.
- General anesthesia result in increased risk for developmental delay, learning disabilities (eg, language and abstract reasoning deficits), and attention deficit-hyperactivity disorder has been reported.
- The use of the feed-and-bundle technique, is effective in reducing infant motion and ensuring high-quality images
- Worldwide survey(2020),340 centres = Use of sedation during MRI was reported as Always 21.2% , >75% of the time 8.3%, 18.1% as >75% of the time reported and 29.1% reported <25% .
- US NICU (n = 96 centers), 64% responded use the feed and wrap method, 32% used sedation, and 3% used general anesthesia (2017).

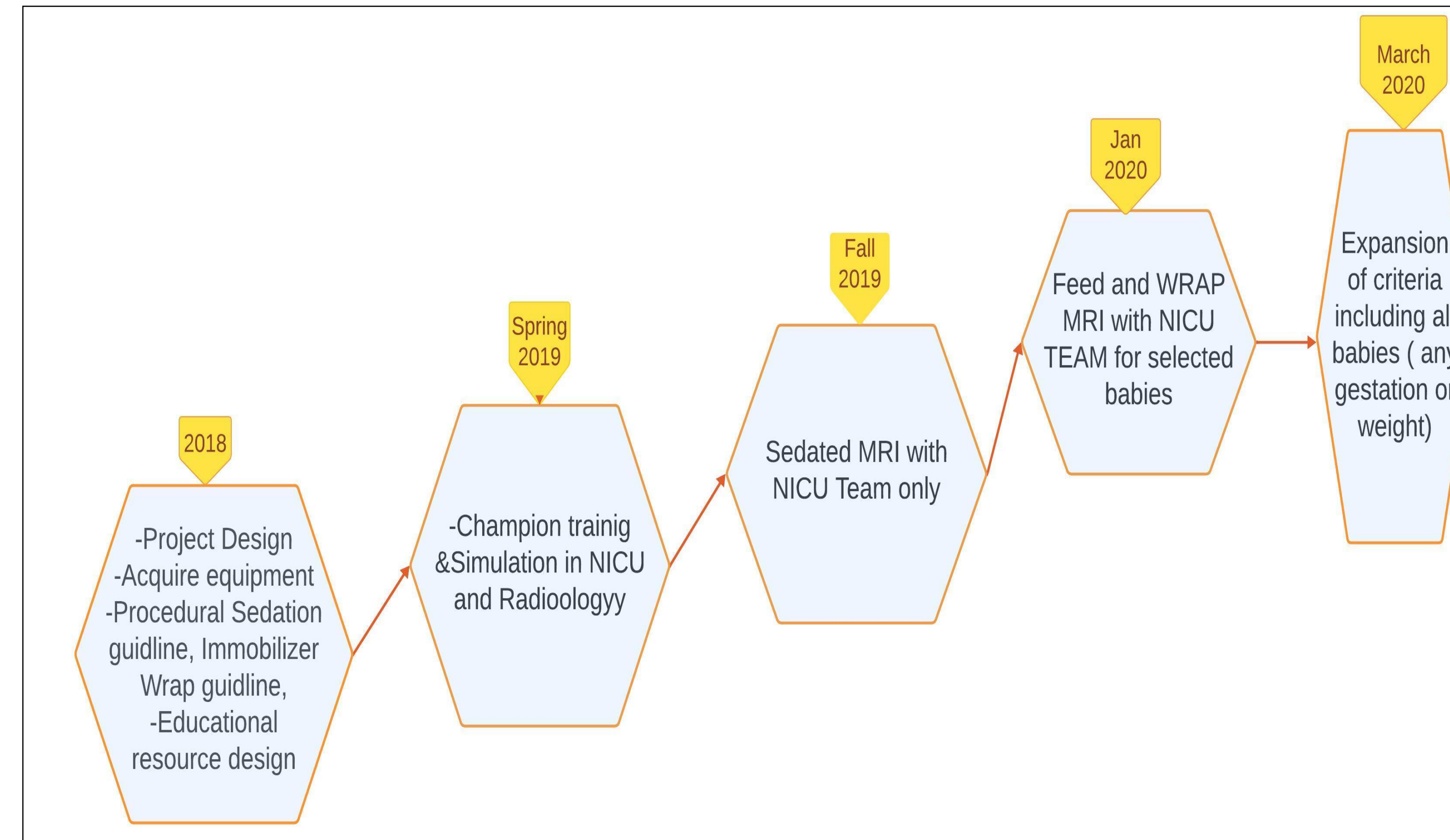
Our setting/ old state

- 24 level 2/3 combined NICU in an academic hospital
- All MRI booked through Anesthesia – Pediatric non urgent one day/week
- Pediatric urgent book thru OR booking coordinating thru Anesthesia

FISH BONE diagram



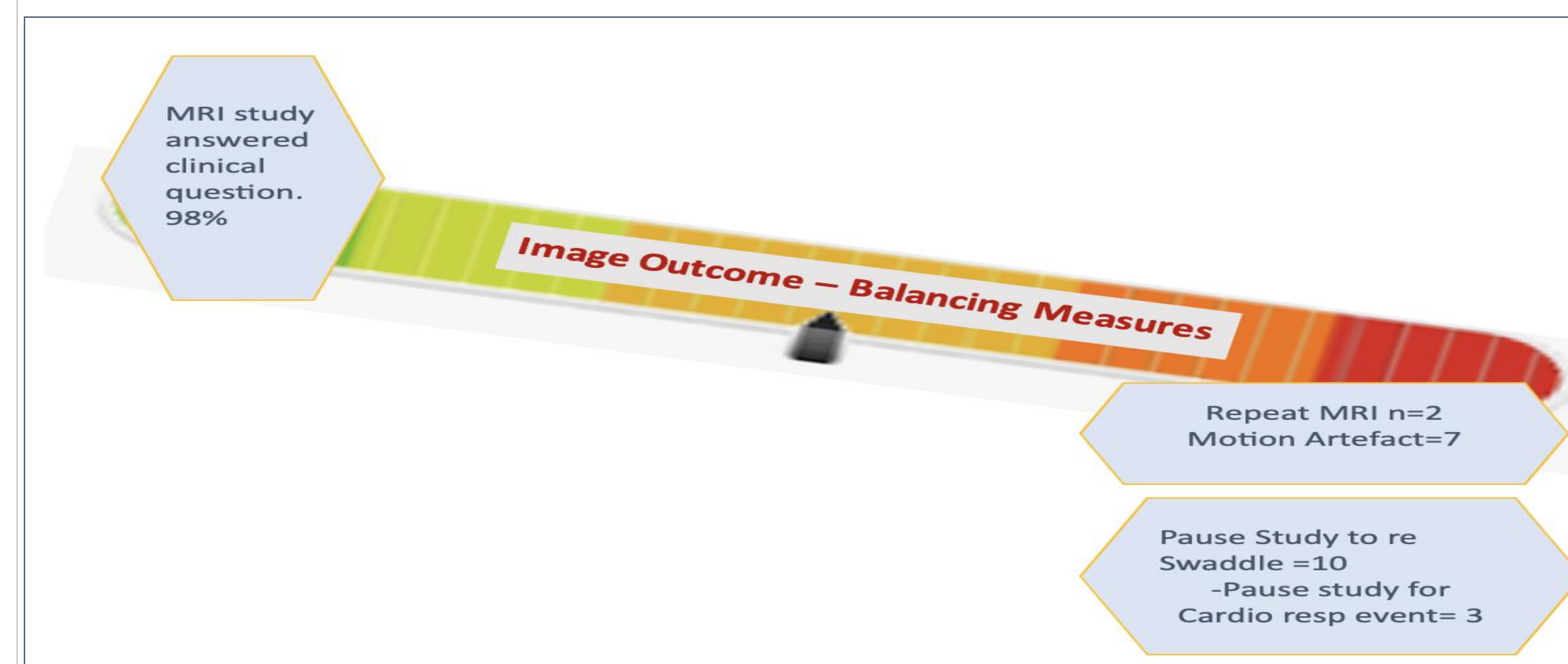
PDSA



MRI for NICU Patients: Clinical Pathways

	Prep Time	Supervision	Clinical Preparation	Sedation
NON-INTUBATED	Non-Sedated 60 minutes	RN, RT Resident/Fellow (if unstable)	Feed infant 30-45 minutes prior to departure Place infant in Med-Vac Infant Immobilizer as ordered (see appendix B)	N/A
	Sedated 60 minutes	RN, RT Resident/Fellow (if unstable)	NPO as per guidelines (see below) Confirm MRI time prior to giving sedations Give sedation 30-45 minutes prior to procedure (or as per order) Place infant in Med-Vac Infant Immobilizer as ordered (see appendix B)	Sedation will be ordered by the medical team prior to the MRI as per the NICU Drug Manual guidelines. Typical medications include Chloral Hydrate and Midazolam. Additional doses of sedation above the standard range must be approved by the attending neonatologist/fellow.
INTUBATED	Sedated 2 hours (minimum)	RN, RT Resident/Fellow	NPO as per guidelines (see below) Confirm MRI time prior to giving sedation Ensure ETT is secure and confirm placement Confirm respiratory stability with blood gas/or TcPCo2 monitoring (adjust respiratory support as indicated) Place infant in Med-Vac Infant Immobilizer as ordered (see appendix B)	If sedation remains inadequate, the patient will need to return to the NICU and the MRI rescheduled. The subsequent method to be used for MRI completion will be at the discretion of the attending neonatologist.

NPO Guidelines for MRI
(Patients that are fed are ineligible to receive sedation due to risk of aspiration)
Formula fed infant: NPO for at least 6 hours prior to MRI
Breast milk fed / breast fed infant: NPO for at least 4 hours prior to MRI

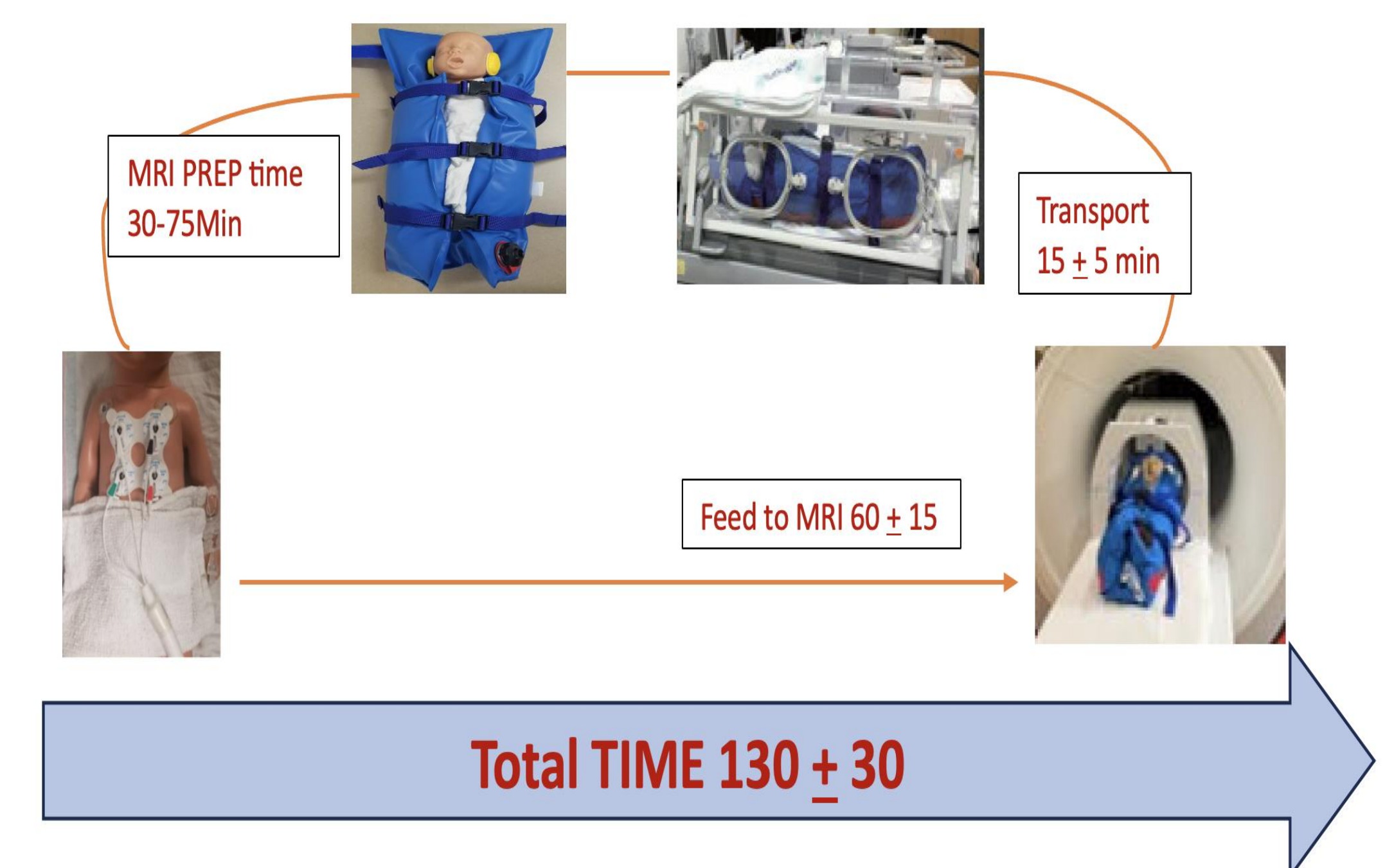


Results

Descriptive characteristics of Cohort (total Scan 100) Jan 2020 to September 2023

Male (n)	67/100
GA at time of scan (weeks)	32 ± 5
Weight at time of scan (Gram)	2039.7 ±784.4 (smallest 1010 gram)
NIV (n)	23
Intubated (n)	37
Body Region (n)	Brain 92
Non contrast MRI (n)	24

Indication of Brain MRI	Number of scan (92)
Hypoxic Ischemic Encephalopathy	27
Meningitis (r/O infection)	16
R/O seizures	19
Congenital brain malformation	8
Post Hemorrhagic ventriculomegaly	4
Congenital hydrocephalus	3
Central Hypotonia	3
Birth Trauma	3
Cutaneous vascular lesion	3
Non CNS congenital /genetic condition	5
Microcephaly	1



Future Plan

- Shortened MRI protocol
- Extension of Wrap to Outside NICU (pediatric –up to one year population)
- Use of Intranasal midazolam for sedation if needed

Reference

- Walker, S.M., 2013. Biological and neurodevelopmental implications of neonatal pain. Clin. Perinatol. 40, 471–491.
- Knudsen, L.M.M., Moen, A., 2015. Practical planning to maintain premature infants' safety during magnetic resonance imaging: a systematic Review. Adv. Neonatal Care 15, 23–37.
- El-Dib, M., 2020. Survey on Neuroimaging of Premature Infants. Newborn Brain Society. Heller, B.J., Yudkowitz, F.S., Lipson, S., 2017.
- Can we reduce anesthesia exposure? Neonatal brain MRI: swaddling vs. sedation, a national survey. J. Clin. Anesth. 38, 119–122.