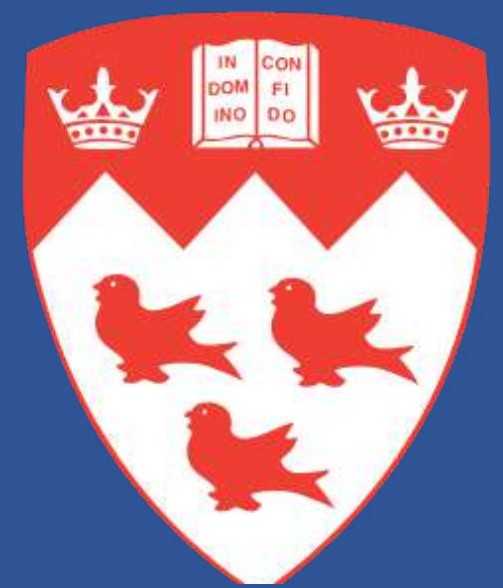


Task-Shifting Cesarean Sections in Low- and Middle-Income Countries: A Systematic Review and Meta-analysis

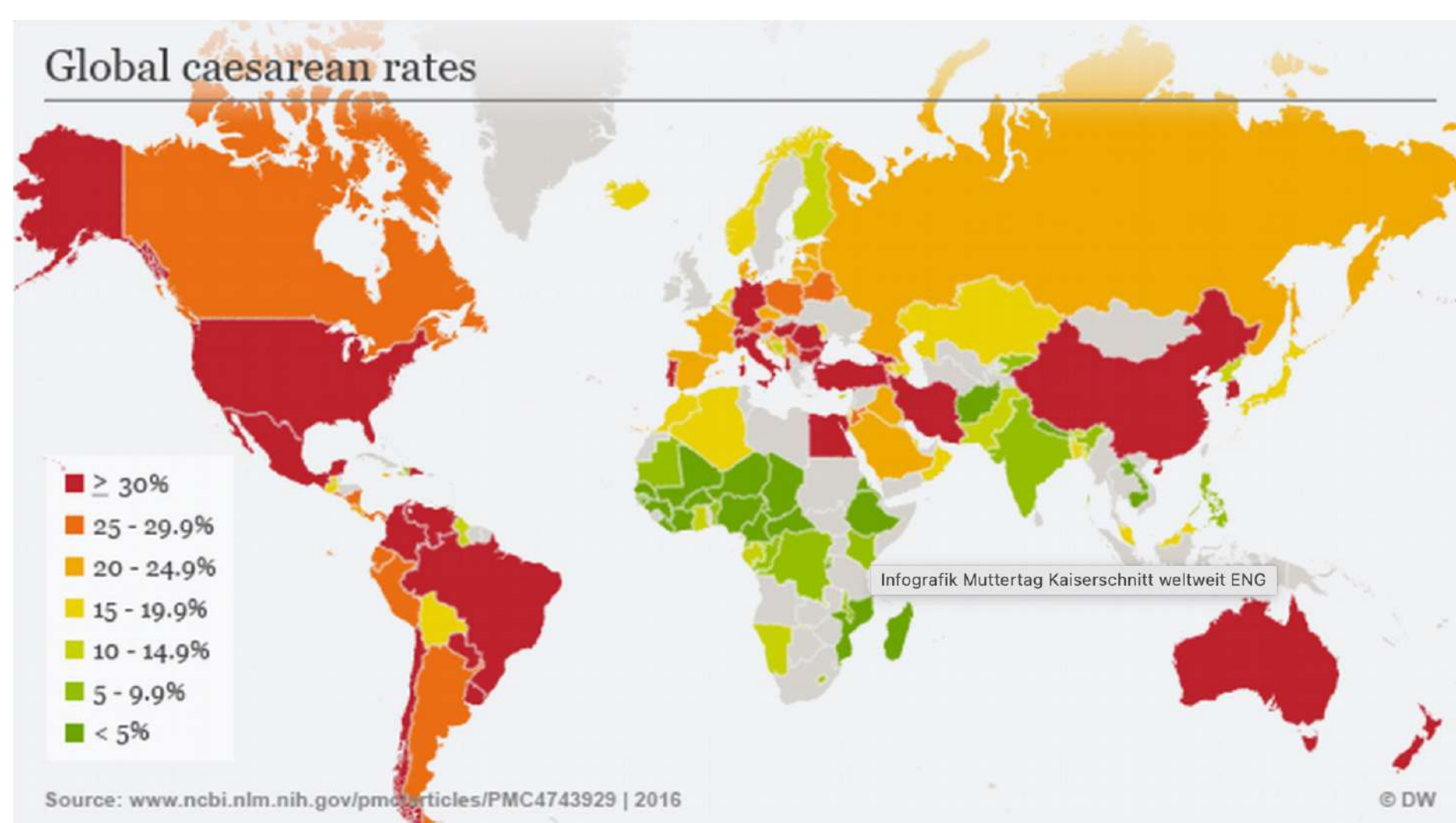


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Background & Rationale

- Caesarean section (CS) is the most performed operation worldwide, however providing timely and safe access remains a significant challenge in low and middle-income countries (LMIC).
- Maternal mortality ratio (MMR) continues to be 14-times higher in low/middle-income countries (LMIC) compared to high income countries, with 94% of maternal deaths related to childbirth occurring in LMIC.
- One strategy to improve access to both medical and surgical services has been in use since the mid-1900's in Sub-Saharan Africa, and involves training non-physician clinicians (NPCs) to provide certain medical services.
- NPC are known to have lower training costs, typically shorter total training time of 2-3 years, and higher retention rates in the areas they train, rendering them an excellent healthcare resource with the potential to help change the provision of essential services in LMIC
- Task shifting has the potential to increase the coverage of health services and bridge the current gap seen in LMIC caused in large part by a crisis of limited human resources



Task Shifting



Figure 1. Van Duinen, a Dutch MD, cofounded CapaCare with Bolkan, a Norwegian surgeon. Through CapaCare they offer a two year training program teaching community health officers how to do Cesarean Sections, appendectomies and hernia repairs. Simultaneously, they conducted a prospective cohort study to assess maternal mortality and morbidity, as well as fetal wellbeing.

Research Objectives

- The objective of this systematic review and meta-analysis is to investigate maternal and perinatal outcomes following CS performed by NPCs in LMIC in comparison to traditional physician providers.
- Addressing the clinical outcomes related to maternal and newborn health prior to the promotion of widespread adoption of task-shifting

Methods

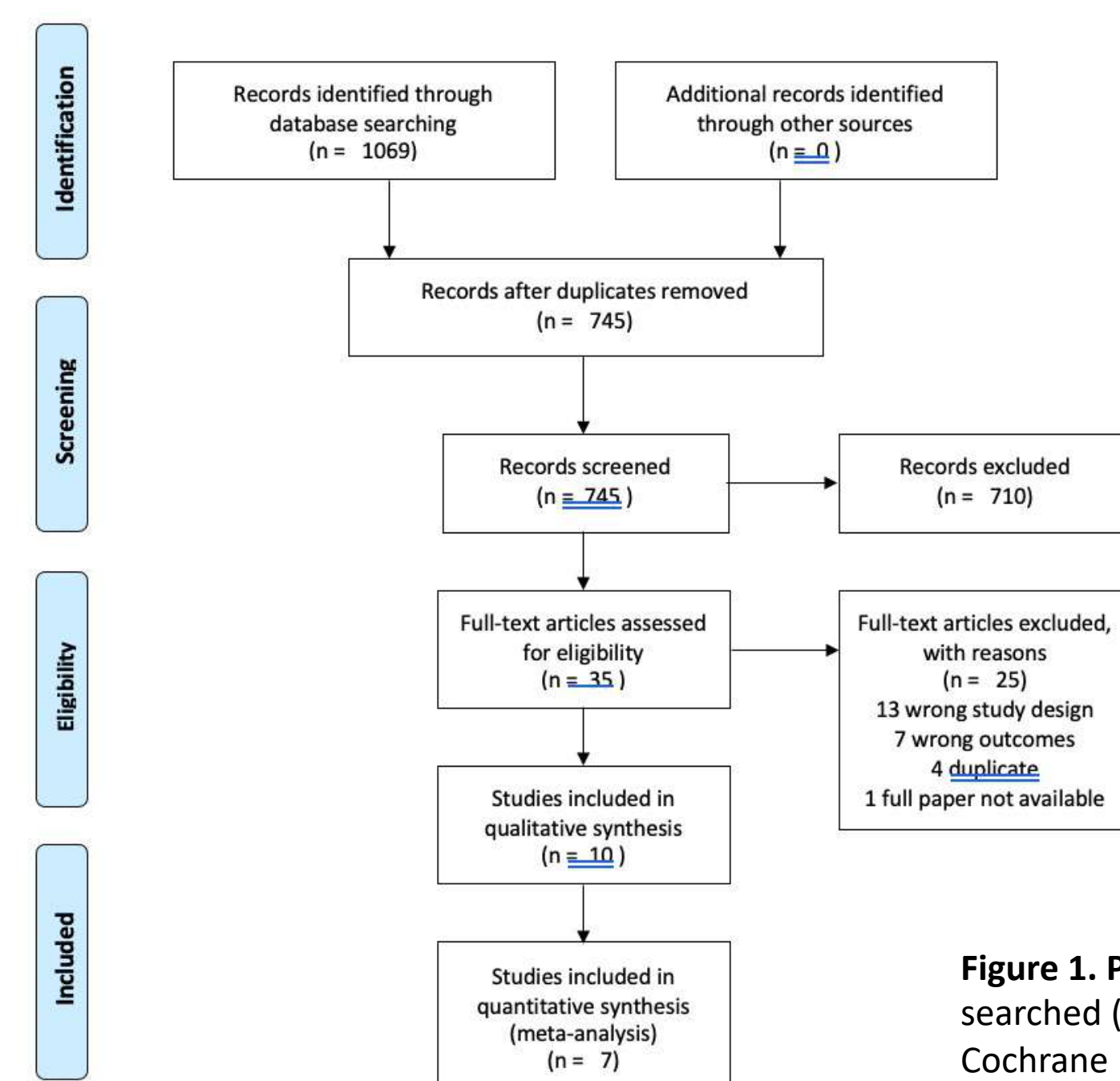


Figure 1. PRISMA Flow Diagram. Electronic databases searched (1) Ovid MEDLINE, (2) Ovid EMBASE, (3) the Cochrane Library, including the Central Register of Controlled Trials (CENTRAL), (4) Web of Science, and (5) LILACS from inception to January 2022.

Results

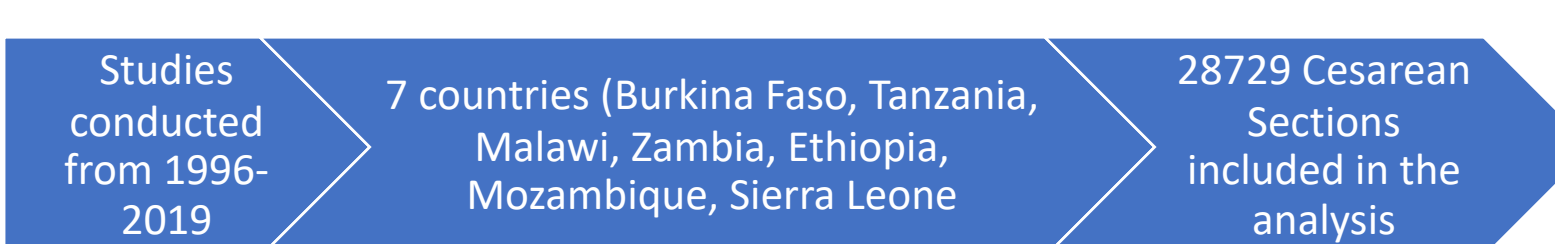


Table 1. Primary Outcome of Interest: Maternal Mortality

Study or Subgroup	NPC	MD	Odds Ratio	Odds Ratio		
	Events	Total	Events	Total	M-H, Random, 95% CI	M-H, Random, 95% CI
Chilopora 2016	11	1569	0	185	4.5%	2.74 [0.16, 46.65]
Fenton 2003	67	5256	18	2814	20.8%	2.01 [1.19, 3.38]
Gajewski 2019	0	544	0	770	Not estimable	
Gessesew 2011	9	1574	8	1261	16.0%	0.90 [0.35, 2.34]
Hounton 2009	26	733	19	1572	20.0%	3.01 [1.65, 5.47]
McCord 2009	16	945	5	143	15.3%	0.48 [0.17, 1.32]
Pereira 1996	7	958	10	1113	15.9%	0.81 [0.31, 2.14]
van Duinen 2019	1	443	15	831	7.5%	0.12 [0.02, 0.93]
Total (95% CI)	12022	8689	100.0%	1.09 [0.56, 2.14]		
Total events	137	75				
Heterogeneity: Tau ² = 0.49; Chi ² = 20.01, df = 6 (P = 0.003); I ² = 70%						
Test for overall effect: Z = 0.26 (P = 0.79)						

Table 2. Secondary Outcome of Interest: Rates of Wound Infection

Study or Subgroup	NPC	MD	Odds Ratio	Odds Ratio		
	Events	Total	Events	Total	M-H, Random, 95% CI	M-H, Random, 95% CI
Chilopora 2016	137	1875	14	256	36.7%	1.36 [0.77, 2.40]
Gajewski 2019	9	544	12	770	15.5%	1.06 [0.44, 2.54]
Hounton 2009	14	733	15	1572	21.9%	2.02 [0.97, 4.21]
van Duinen 2019	14	443	23	831	25.9%	1.15 [0.58, 2.25]
Total (95% CI)	3595	3429	100.0%	1.37 [0.97, 1.93]		
Total events	174	64				
Heterogeneity: Tau ² = 0.00; Chi ² = 1.67, df = 3 (P = 0.64); I ² = 0%						
Test for overall effect: Z = 1.78 (P = 0.07)						

Table 3. Secondary Outcome of Interest: Rates of Wound Disruption

Study or Subgroup	NPC	MD	Odds Ratio	Odds Ratio		
	Events	Total	Events	Total	M-H, Random, 95% CI	M-H, Random, 95% CI
Chilopora 2016	40	1875	4	256	18.4%	1.37 [0.49, 3.87]
Hounton 2009	1	733	4	1572	4.1%	0.54 [0.06, 4.80]
Pereira 1996	44	958	24	1113	77.5%	2.18 [1.32, 3.62]
Total (95% CI)	3566	2941	100.0%	1.89 [1.21, 2.95]		
Total events	85	32				
Heterogeneity: Tau ² = 0.00; Chi ² = 1.95, df = 2 (P = 0.38); I ² = 0%						
Test for overall effect: Z = 2.81 (P = 0.005)						

Table 4. Secondary Outcome of Interest: Rates of Reoperation

Study or Subgroup	NPC	MD	Odds Ratio	Odds Ratio		
	Events	Total	Events	Total	M-H, Random, 95% CI	M-H, Random, 95% CI
Chilopora 2016	28	1875	5	256	13.9%	0.76 [0.29, 1.99]
van Duinen 2019	5	443	8	831	42.2%	1.17 [0.38, 3.61]
Total (95% CI)	2318	1087	100.0%	0.91 [0.44, 1.90]		
Total events	33	13				
Heterogeneity: Tau ² = 0.00; Chi ² = 0.33, df = 1 (P = 0.56); I ² = 0%						
Test for overall effect: Z = 0.24 (P = 0.81)						

Table 5. Secondary Outcome of Interest: Perinatal Mortality

Study or Subgroup	NPC	MD	Odds Ratio	Odds Ratio		
	Events	Total	Events	Total	M-H, Random, 95% CI	M-H, Random, 95% CI
Chilopora 2016	201	1875	33	256	13.9%	0.81 [0.55, 1.20]
Fenton 2003	682	5256	224	2814	17.1%	1.72 [1.47, 2.02]
Gessesew 2011	294	1574	212	1261	16.7%	1.14 [0.94, 1.38]
Hounton 2009	145	733	170	1572	16.2%	2.03 [1.60, 2.59]
McCord 2009	49	785	4	116	6.0%	1.86 [0.66, 5.27]
Pereira 1996	69	985	99	1113	15.0%	0.77 [0.56, 1.05]
van Duinen 2019	65	487	143	899	15.1%	0.60 [0.59, 1.10]
Total (95% CI)	11695	8021	100.0%	1.18 [0.86, 1.61]		
Total events	1505	885				
Heterogeneity: Tau ² = 0.14; Chi ² = 51.99, df = 6 (P < 0.00001); I ² = 88%						
Test for overall effect: Z = 1.04 (P = 0.30)						

Discussion

- NPCs provide the bulk of surgical care in obstetrics, as well as contributing significantly to general surgery procedures.
- Our systematic review demonstrated no difference in maternal mortality, perinatal mortality, wound infection, or reoperation between physician and non-physician providers; however, patients treated by physicians were less likely to experience a non-infectious wound complication such as dehiscence.
- The literature provides evidence for higher attrition rates of NPCs compared to MDs, particularly in rural settings, and favourable economic evaluation of the training costs associated with NPCs vs MDs.
- Current healthcare worker crisis across the world and particularly in low- and middle-income countries can be addressed by the complimentary work of NPCs along MDs.

Strengths

Broad Eligibility Criteria

Focus on Clinically Pertinent Outcomes of Interest

Large Number of included Studies

Limitations

Heterogeneous reporting of secondary outcomes

Selection bias in distribution of more challenging CS

Lack of international standardization of NPC training

Future Directions

- Implementation of standardized training programs for NPCs
- Policy changes to recognize task shifting as a plausible solution to the ongoing healthcare human resource crisis
- Standardized training for NPCs
- Ensure upkeep of surgical skills for NPCs through logbooks, training and audits.

Acknowledgements

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