

state with baseline data, root cause analysis, and surveys to identify common and impactful failures. A Key Driver Diagram defined leading factors. Run charts and later SPC charts captured change over time. A communication board displays ongoing work; weekly huddles evaluate progress and barriers.

**Results** We met and exceeded goal since in 12/2017. We have sustained our improvement with an average of 92% as of 06/2019. This work also helped decrease time from referral to consult for all clinic referrals from 65.4 business to 21 business days. Additionally, this project helped our clinic lower no-show rates from 15% to 6% making it the lowest rate for the entire Specialty Center. Furthermore, it helped increase patient volume by an average of 30 more patients per month starting 07/17 and \$375,000 increased revenue even before factoring in additional downstream revenue. During this period, patient satisfaction scores reached 93–100%.

**Conclusions** Standardizing, empowering the care team, and improving communication across primary and specialty care brought relief to over 800 families, connecting suffering children with the right care at the right time.

## 6 IMPLEMENTATION ANALYSIS OF A COMPREHENSIVE PATIENT SAFETY PROGRAM IN GUATEMALA

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10.1136/bmjog-2019-ihl.6

**Background** Although patient safety programs improve clinical outcomes in a variety of settings, little is known about factors affecting successful implementation of safety programs in low and middle-income countries (LMICs).

**Objectives** Our goal was to investigate the implementation of a comprehensive patient safety program for pediatric care in Guatemala.

**Methods** We performed a mixed-methods implementation analysis of a comprehensive patient safety program in 11 pediatric units at the Roosevelt Hospital in Guatemala. The safety program was contextualized to each unit, and included assessment of the safety culture, perioperative checklists, and targeted QI interventions. We performed qualitative analysis of implementation challenges using semi-structured interviews with hospital staff (n=82) using the Consolidated Framework for Implementation Research (CFIR), with follow-up focus group interviews one year later. We also measured staff views towards implementation challenges using the quantitative Evidence Based Practice Attitude Scale (EBPAS-36). All data were triangulated to identify emerging themes as well as barriers and facilitators to implementation.

**Results** We classified implementation challenges within 25 CFIR constructs. We identified several emerging themes:

1) High staff receptivity to safety programs, including recognition of relevance to their patient population; 2) Importance of increasing staff knowledge and awareness about patient safety, 3) Difficulties with high patient care demands; 4) Limited governance and leadership engagement; 5) Contextualization of safety programs to local needs.

**Conclusions** Our study provides insight into hospital staff perspectives on implementation challenges for patient safety programs in Guatemala. Definition of implementation challenges may enhance successful adoption of safety practices in low-resource settings.

## 7 THE MULTIPLE SCLEROSIS CONTINUOUS QUALITY IMPROVEMENT COLLABORATIVE (MSCQI): INTERIM RESULTS OF THE 3-YEAR MULTI-CENTER PROSPECTIVE STEP-WEDGE RANDOMIZED RESEARCH STUDY

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10.1136/bmjog-2019-ihl.7

**Background** MS-CQI is the first multi-center, randomized research study aiming to improve population health outcomes for people with multiple sclerosis (MS) using quality improvement (QI).

**Objectives** (1) benchmark performance and study variation in utilization and outcomes; (2) provide performance feedback to MS centers; and (3) compare effectiveness of QI versus usual care controls on improving outcomes.

**Methods** Four centers are participating following approximately 5,000 people with MS. We collect 21 Patient Reported Outcome Measures (PROMs) and 11 Electronic Health Record (EHR) measures. System-level de-identified EHR data is collected for all clinical encounters. Individual-level PROM data is collected from participants who consent. Centers are randomized to QI or usual care following a step-wedge randomized design beginning in Year 2.

**Results** MSCQI has recently completed Year 2. At the end of Year 1, EHR n=2,755 encounters, and PROM n=269 individuals (tables 1–3). There is significant variation in EHR findings, including proportion of patients on disease modifying therapy (DMT), MRI, ED, hospitalizations, urgent care, and relapses (table 2), as well as PROM findings (table 3) including depression, fatigue, cognition, sleep, communication, and work-related impairment. In Year 2, the first center (Center C) was randomized to QI. Center C has higher average depression and fatigue severity than the Collaborative, but has realized a reduction in quarterly relapse rate since beginning QI intervention in Quarter 4 (figure 1).

**Conclusions** MSCQI has succeeded in benchmarking system-level variation and has begun studying outcomes of QI intervention versus usual care. MSCQI has potential to improve

Abstract 7 Table 1

	Center A (Rural Community Hospital)	Center B (Urban Academic Center)	Center C (Urban Large Private Practice)	Center D (Rural Academic Center)	MS-CQI Collaborative (Total)
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)
Age (mean, SD)	52.2 (12.0)	49.2 (13.3)	49.7 (12.6)	52.2 (12.7)	51.1 (12.6)
Sex (n,%)					
Male	204 (21.2)	116 (26.6)	138 (22.4)	194 (26.2)	652 (23.7)
Female	759 (78.8)	320 (73.4)	478 (77.6)	546 (73.8)	2,103 (76.3)
Comorbidities (n,%)					
Anxiety	300 (31.2)	59 (13.5)	110 (17.9)	144 (19.5)	613 (22.3)
Arthritis	44 (4.6)	22 (5.1)	83 (13.5)	72 (9.7)	221 (8.0)
Asthma	68 (7.1)	40 (9.2)	31 (5.0)	63 (8.51)	202 (7.3)
Back Pain	139 (14.4)	24 (5.5)	56 (9.1)	110 (14.9)	329 (11.9)
COPD	21 (2.2)	1 (0.2)	7 (1.1)	7 (1.0)	36 (1.3)
Cancer	22 (2.3)	40 (9.2)	51 (8.3)	85 (11.5)	198 (7.2)
Depression	368 (38)	79 (18.1)	180 (29.2)	250 *33.8	877 (31.8)
Diabetes	69 (7.2)	28 (6.4)	46 (7.5)	53 (7.2)	196 (7.1)
Heart Disease	26 (2.7)	24 (5.5)	30 (4.9)	86 (11.6)	166 (6.0)
Hypercholesterolemia	191 (19.8)	23 (5.3)	87 (14.1)	140 (18.9)	441 (16.0)
Hypertension	228 (23.7)	106 (24.3)	193 (31.3)	172 (23.2)	699 (25.4)
Insomnia	124 (12.9)	5 (1.2)	18 (2.9)	18 (2.4)	165 (6.0)
Irritable Bowel Syndrome	36 (3.7)	16 (3.7)	6 (1.0)	27 (3.7)	85 (3.1)
Kidney Disease	9 (0.9)	20 (4.6)	7 (1.1)	29 (3.9)	65 (2.4)
Liver Disease	2 (0.2)	0 (0)	4 (0.7)	16 (2.2)	22 (0.8)
Lung Disease	2 (0.2)	2 (0.5)	11 (1.8)	16 (2.2)	31 (1.1)
Migraine	203 (21.1)	36 (8.3)	186 (30.2)	150 (20.3)	575 (20.9)
Osteoporosis	43 (4.5)	37 (8.5)	7 (1.1)	31 (4.2)	118 (4.3)
Stroke (CVA)	14 (1.5)	1 (0.2)	20 (3.3)	12 (1.62)	47 (1.7)
Thyroid Disease	85 (8.8)	64 (14.7)	86 (14.0)	85 (11.5)	320 (11.6)
Ulcer	1 (0.1)	1 (0.2)	6 (1.0)	4 (0.5)	12 (0.4)
Other	27 (2.8)	10 (2.3)	3 (0.5)	1 (0.1)	41 (1.5)

Abstract 7 Table 2

Proportion on DMT	Center A (Rural Community Hospital)	Center B (Urban Academic Center)	Center C (Urban Private Practice)	Center D (Rural Academic Center)	MS-CQI (Total)	ANOVA p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
Proportion of patients (n,%)	742 (77.1)	357 (81.9)	520 (84.4)	464 (62.7)	2,083 (75.6)	<0.0001	*
Proportion with at least 1 MRI	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
Brain MRI (n,%)	623 (64.7)	315 (72.3)	375 (60.9)	387 (52.3)	1,700 (61.7)	<0.0001	*
C-Spine MRI (n,%)	371 (38.5)	117 (26.8)	189 (30.7)	156 (21.1)	833 (30.2)	<0.0001	*
T-Spine MRI (n,%)	158 (16.4)	93 (21.3)	136 (22.1)	68 (9.2)	455 (16.5)	<0.0001	*
# of Hospitalizations	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
0 (n,%)	916 (95.1)	408 (93.6)	557 (90.4)	630 (85.1)	2,511 (91.1)	<0.0001	*
1 (n,%)	32 (3.3)	25 (5.7)	52 (8.4)	81 (11.0)	190 (6.9)		
2+ (n,%)	15 (1.6)	3 (0.7)	7 (1.1)	2 (3.9)	54 (2.0)		
# of ED visits	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
0 (n,%)	869 (90.2)	386 (88.5)	587 (95.3)	649 (87.7)	2,491 (90.4)	<0.0001	*
1 (n,%)	52 (5.4)	41 (9.4)	26 (4.2)	67 (9.1)	186 (6.8)		
2+ (n,%)	42 (4.4)	9 (2.1)	3 (0.5)	24 (3.2)	78 (2.8)		
# of Urgent Care visits	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		

0 (n,%)	940 (97.6)	421 (96.6)	609 (98.86)	705 (95.3)	2,675 (97.1)	<0.0001	*
1 (n,%)	18 (1.9)	9 (2.1)	6 (1.0)	26 (3.5)	59 (2.1)		
2+ (n,%)	5 (0.5)	6 (1.4)	1 (0.2)	9 (1.2)	21 (0.8)		
Outcomes (Means)	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
Hospitalized (mean,SD)	0.07 (0.40)	0.07 (0.28)	0.11 (0.39)	0.21 (0.63)	0.12 (0.46)	<0.0001	*
ED Visit (mean,SD)	0.19 (0.74)	0.14 (0.45)	0.05 (0.24)	0.21 (0.78)	0.16 (0.63)	<0.0001	*
UC Visit (mean,SD)	0.03 (0.21)	0.05 (0.27)	0.01 (0.13)	0.06 (0.33)	0.04 (0.25)	0.0007	*
# of Relapses (Exacerbations)	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
0 (n,%)	892 (92.6)	385 (88.3)	512 (83.1)	703 (95.0)	2,492 (90.5)	<0.0001	*
1 (n,%)	62 (6.4)	49 (11.2)	97 (15.8)	34 (4.6)	242 (8.8)		
2+ (n,%)	9 (0.9)	2 (0.5)	7 (1.1)	3 (0.4)	21 (0.8)		
Relapses (Annualized)	Center A	Center B	Center C	Center D	MS-CQI (Total)	p	Significant
Patients (n,%)	963 (35.0)	436 (15.8)	616 (22.4)	740 (26.9)	2,755 (100)		
Relapse Rate (mean,SD)	0.08 (0.32)	0.12 (0.34)	0.18 (0.43)	0.05 (0.24)	0.10 (0.34)	<0.0001	*

Key: DMT = Disease modifying therapy  
 MRI = Magnetic resonance imaging  
 C-Spine = Cervical spinal cord  
 T-Spine = Thoracic spinal cord  
 ED = Emergency Department  
 UC = Urgent care visit  
 ANOVA = Analysis of Variance

Abstract 7 Table 3

Survey Name	Center A (Rural Community Hospital)			Center B (Urban Academic Center)			Center C (Urban Private Practice)			Center D (Rural Academic Center)			MS-CQI (Total)			ANOVA (p)
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Patient Determined Disease Steps (PDDS)- Most Recent	57	1.5	1.8	71	1.5	2.2	57	1.6	1.8	45	2.3	2.3	230	1.7	2.0	
Depression Severity (PHQ-9)	47	6.0	3.6	73	5.8	5.1	66	5.7	4.3	58	8.2	5.2	244	6.4	4.8	*
Fatigue Severity (PROMIS Fatigue-MS Raw Score)	44	21.4	5.5	72	19.9	7.2	65	21.2	7.3	53	24.4	8.1	234	21.6	7.3	*
Neuro-Qol Anxiety	66	17.2	6.6	84	17.2	6.2	66	16.0	5.7	55	19.2	7.5	271	17.4	6.5	0.060
Neuro-Qol Cognitive	65	29.6	7.6	83	31.9	7.1	66	32.2	6.2	55	28.9	7.8	269	30.8	7.3	*
Neuro-Qol Lower Exetremity Function	59	35.1	6.0	70	34.8	7.7	57	34.9	7.3	46	33.2	7.8	232	34.6	7.2	
Neuro-Qol Upper Exetremity Function	59	37.7	4.1	69	38.3	3.4	57	37.6	4.9	46	37.4	3.4	231	37.8	4.0	
Neuro-Qol Stigma	56	11.5	4.2	68	11.9	5.2	59	12.4	5.3	44	14.1	5.9	227	12.4	5.2	
Neuro-Qol Social Roles and Activities - Participation	55	32.3	6.4	67	32.6	7.3	59	31.7	7.2	44	29.8	7.6	225	31.8	7.2	
Neuro-Qol Social Roles and Activities - Satisfaction	53	30.3	7.1	67	29.5	8.2	59	28.2	8.2	44	26.4	8.1	223	28.8	8.0	
Neuro-Qol Sleep	50	18.4	5.4	64	18.8	6.4	58	19.1	5.6	45	21.5	5.6	217	19.3	5.9	*
Neuro-Qol Communication	50	88.0	14.1	64	93.4	11.7	57	89.3	10.5	45	88.6	11.8	216	90.1	12.1	*
Treatment Satisfaction (TSQM-9) Effectiveness	37	70.6	20.5	31	69.5	19.4	27	80.0	13.4	23	74.0	20.2	118	73.1	18.9	
Treatment Satisfaction (TSQM-9) Convenience	37	74.0	21.7	31	72.7	19.6	27	77.9	16.2	23	81.5	16.6	118	76.0	19.1	
Treatment Satisfaction (TSQM-9) Global	37	69.9	22.5	31	69.5	20.2	27	81.6	13.9	23	75.8	20.0	118	73.6	20.1	
WWPAI Impairment While Working	24	10.8	12.5	25	13.6	19.1	27	28.8	30.3	15	29.3	23.8	91	20.0	23.6	*
WWPAI Activity Impairment	25	18.0	22.0	25	23.2	22.7	28	29.6	28.0	16	26.6	21.2	94	24.3	24.0	
My MS Relapse- Did you experience a relapse recently?	48	0.5	0.8	58.0	0.6	1.2	53.0	0.3	0.7	46.0	0.8	1.4	205.0	0.5	1.1	

\*p<0.05

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Asthma	68 (7.1)	40 (9.2)
Back Pain	139 (14.4)	24 (5.5)
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Insomnia	124 (12.9)	5 (1.2)
Irritable Bowel Syndrome	36 (3.7)	16 (3.7)
Kidney Disease	9 (0.9)	20 (4.6)
Liver Disease	2 (0.2)	0 (0)
Lung Disease	2 (0.2)	2 (0.5)
Migraine	203 (21.1)	36 (8.3)
Osteoporosis	43 (4.5)	37 (8.5)
Stroke (CVA)	14 (1.5)	1 (0.2)
Thyroid Disease	85 (8.8)	64 (14.7)
Ulcer	1 (0.1)	1 (0.2)
Other	27 (2.8)	10 (2.3)

**Abstract 7 Figure 1** Year 2 Center C Results: Statistical Process Control (SPC) analyses describing the variation in performance compared to the overall average performance of the MSCQI Collaborative. Blue squares represent point estimates, the green line represents the overall average, and red lines denote 3 Sigma upper and lower control limits. Points outside control limits (shown in red) indicate non-random (special cause) variation

MS population health outcomes using improvement science methods.

### 8 TRANSITIONAL CARE CENTER: A CENTER FOR MEDICAL AND NON-MEDICAL EXCELLENCE

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10.1136/bmj-2019-ih1.8

**Background** In 2016, in PCMC, only 75% high risk patients were receiving post hospital follow up care. Given that 24% of our high-risk patients are readmitted, it is fair to assume that no follow up results in higher utilization. For those that did receive follow up, it was variable depending on the physician. Primary care offices did not have a robust process for

social needs evaluation. Hence, patients used more ED services for social needs. Programs that address both medical and non medical needs of patients show higher success but are often limited.

**Objectives** Reduce utilization by addressing medical and non-medical needs of high-risk patients.

**Methods** TCC appointment consists of: 40-minute medical assessment by a physician, pharmacist lead medication reconciliation, social worker assessment for social and behavioral needs, care navigator to secure resources, and care coordinator to manage the care plan for upto 90 days.

**Results** A single centered retrospective study was used to evaluate pre and post utilization of high risk patients that were treated in TCC and a similar control group that received care with a PCP. The demographics of both groups were evaluated to ensure similar representation. The results showed a significant decrease in utilization for the TCC patients compared to