Supplemental materials for

Gomes LA, Fernandes R, Caeiro C, et al. A stratified approach for managing patients with low back pain in primary care (SPLIT Program): a before-and-after study. *Ann Fam Med*. 2024;22(3):195-202.

Supplemental Appendix and Supplemental Tables 1-4

Supplemental Appendix

METHODS

The SPLIT program

- **Screening/Assessment consultation:** Following the family physicians' (FP) referral, a 30-minute assessment consultation with the physical therapist (PT) was performed. This included a screen for red flags and specific pathologies, neurologic examination through The Atlas Scoring Tool, and patients' risk stratification through the STarT Back Screening Tool (SBST).[30] The SBST is a self-reported instrument of 9 questions screening for 8 physical (ie, referred leg pain, comorbid pain, and disability) and psychosocial predictors (ie, fear, catastrophizing, anxiety, depression, and bothersomeness) which are potentially modifiable by treatment that allows 1) the categorization of patients with low back pain (LBP) in low (≤3 physical and/or psychosocial predictors), medium (>3 physical and/or psychosocial predictors without predominance of psychosocial ones), or high-risk (>3 physical and/or psychosocial predictors with predominance of psychosocial ones) of developing poor disability, and; 2) the consequent suggestion for the matched treatment.[11] Based on the risk subgroup, the PT collected the patients' history, concerns, and expectations and, if necessary, conducted a brief physical examination (ie, back pain movements, directional preference, and trunk and lower limb muscle strength and trunk muscles motor control). In addition to this back-related disability, pain intensity, and health-related quality of life (HRQoL) were evaluated. The results of this assessment guided the PT in the delivery of the matched

physical therapy program, which was previously structured accordingly with the best contemporary practices.[7,8,32–34]

- **Low-risk subgroup:** Patients received a minimal intervention of patient education immediately after the assessment consultation. This consisted of a 30-minute face-to-face individual session where reassurance about the benign nature and favorable prognosis of LBP, advice to keep active, return to work, avoid bed resting and self-management was given taking into account the patients' characteristics. To avoid seeking additional treatments or investigations, each patient was advised to re-consult their PT if symptoms persist or worsen. In addition to this, patients were contacted by their PT 2 weeks after the treatment to ensure patients' symptoms were following the natural course. To reinforce key messages, an educational pamphlet was provided.
- **Medium risk subgroup:** Patients received the same minimal intervention described for the low risk subgroup. In addition, taking into account the presence of physical prognostic indicators for poor disability, an evidence-based physical therapy program mainly consisting of exercise and manual therapy was provided aiming to restore disability and pain. To simplify the decision-making process of PT and thus facilitate implementation, management algorithms were developed based on the last revision and update of the Treatment-Based Classification System for LBP by Alrwaily et al. (2016; 2017).[27,28] The number of sessions was flexible, depending on patients' characteristics and symptoms course, however, a limit of 6 individual sessions was stated as sufficient for this subgroup of patients to recover.
- **High risk subgroup:** In addition to the intervention described for medium risk patients, for those with high risk, neuroscience patient education informed by the principles of the cognitive-behavioral approach[29] was provided. This intervention was developed to target the physical and psychosocial obstacles to recovery identified both in the SBST and in the assessment consultation. For this subgroup of patients, the assessment included a more comprehensive exploration of the

impact LBP has on physical and psychological function, namely the identification and understanding of patients' problems regarding the relationship between thoughts, emotions, and behaviors, the consequent treatment plan, which was adjusted to the identified problems and objectives, and respective monitorization. Additionally, a structured and personalized exercise program targeting patient-specific physical limitations (ie, trunk and lower limb deficits in motor control/strength) was provided. Mainly to respect the biological and methodological principles of exercise, and thus allow its effect on patients' physical capacities, a program of 6-week duration with up to 12 individual or group sessions (with approximately 60-minute duration) was generally recommended as likely enough to promote improvements in back-related disability, pain, and psychological function (where possible) but mostly to empower patients to manage ongoing and future LBP episodes.

- For patients who did not respond to the intervention program, an increase of the treatment dosage (ie, progression for medium or high-risk intervention) or back referral to FPs for further investigation or interdisciplinary pain management, was discussed.

Supplemental Table 1. Sensitivity analysis of primary and secondary outcomes over the 6-month follow-up, restricted to the implementation plan period (September 2018 – August 2019)		
	UC	**SPLIT**
Back-related disability (RMDQ, 0 to 24)		
2 months: UC, n = 110; SPLIT, n = 166		
Mean (SD)	9.14 (6.77)	3.31 (4.21)
Achieved MIC, No. (%)[a]	54 (49.1)	124 (74.7)
Poor disability, No. (%)[b]	64 (58.2)	32 (19.3)
6 months: UC, n = 104; SPLIT, n = 145		
Mean (SD)	8.37 (6.83)	3.13 (4.11)
Achieved MIC, No. (%)[a]	53 (51.0)	108 (74.5)
Poor disability, No. (%)[b]	56 (53.8)	26 (17.9)
Pain intensity (NPRS, 0 to 10)		
2 months: UC, n = 110; SPLIT, n = 166		
Mean (SD)	3.88 (2.90)	1.42 (2.01)
Achieved MIC, No. (%)[a]	55 (50.0)	126 (75.9)
6 months: UC, n = 104; SPLIT, n = 145		
Mean (SD)	3.18 (3.24)	1.92 (2.63)
Achieved MIC, No. (%)[a]	60 (57.7)	96 (66.2)
Perceived effect of treatment (GPES, -5 to +5)		
2 months: UC, n = 110; SPLIT, n = 166		
Median (IQR)	3.0 (4.0)	4.0 (2.0)
Achieved MIC, No. (%)[a]	58 (52.7)	123 (74.1)
6 months: UC, n = 104; SPLIT, n = 145		
Median (IQR)	3.0 (4.0)	4.0 (3.0)

Achieved MIC, No. (%)[a]	56 (53.8)	109 (75.2)
HRQoL (EQ-5D-3L, 0 to 1)		
2 months: UC, n = 110; SPLIT, n = 165		
Mean (SD)	0.61 (0.27)	0.80 (0.21)
6 months: UC, n = 104; SPLIT, n = 145		
Mean (SD)	0.59 (0.25)	0.82 (0.24)

EQ-5D-3L = EuroQoL 5 dimensions 3 levels; GPES = Global Perceived Effect Scale; HRQoL = health-related quality of life; IQR = interquartile range; MIC = minimal important change; NPRS = Numerical Pain Rating Scale; RMDQ = Roland-Morris Disability Questionnaire; SD = standard deviation; SPLIT = stratified primary care for low back pain; UC = usual care.

[a] Based on established MIC criteria: ≥30% decrease from baseline for RMDQ and NPRS and a GPES score ≥3.

[b] Based on a cutoff RMDQ score ≥7.

Supplemental Table 2. Sensitivity analysis with effect estimates for the comparison of cohorts (SPLIT vs Usual Care) for primary and secondary outcomes over the 6-month follow-up, restricted to the implementation plan period (September 2018 – August 2019)

	Crude ß/OR (95% CI)[a]	*P* value	Adjusted ß/OR (95% CI)[a]	*P* value
Back-related disability (RMDQ, 0 to 24)				
Raw score	-4.94 (-6.00 to -3.87)	≤.001	-2.78 (-3.62 to -1.93)	≤.001
Achieved MIC, yes vs no[b]	2.51 (1.75 to 3.61)	≤.001	3.42 (1.80 to 6.52)	≤.001
Poor disability, yes vs no[c]	0.10 (0.05 to 0.20)	≤.001	0.67 (0.61 to 0.72)	≤.001
Pain intensity (NPRS, 0 to 10)				
Raw score	-1.83 (-2.31 to -1.35)	≤.001	-0.91 (-1.26 to -0.57)	≤.001
Achieved MIC, yes vs no[b]	1.88 (1.34 to 2.67)	≤.001	2.02 (1.40 to 2.91)	≤.001
Perceived effect of treatment (GPES, -5 to +5)				
Raw score	1.46 (0.95 to 1.96)	≤.001	1.41 (0.89 to 1.93)	≤.001
Achieved MIC, yes vs no[b]	2.21 (1.55 to 3.14)	≤.001	2.29 (1.57 to 3.33)	≤.001
HRQoL (EQ-5D-3L, 0 to 1)				
Raw score	0.19 (0.15 to 0.21)	≤.001	0.11 (0.08 to 0.15)	≤.001

CI = confidence interval; EQ-5D-3L = EuroQoL 5 dimensions 3 levels; GPES = Global Perceived Effect Scale; HRQoL = health-related quality of life; MIC = minimal important change; NPRS = Numerical Pain Rating Scale; OR = odds ratio; RMDQ = Roland-Morris Disability Questionnaire; SPLIT = stratified primary care for low back pain; UC = usual care.

[a] For continuous outcomes (RMDQ, NPRS, GPES, and EQ-5D-3L raw scores over time), crude/adjusted ß values were derived via a linear mixed-effects model for the comparison of UC vs SPLIT. For categorical outcomes (achieved MIC of RMDQ, NPRS, and GPES, along with poor disability), crude/adjusted OR values were derived via a logistic mixed-effects model for the comparison of UC vs SPLIT. Adjusted ß/OR and 95% CI values were adjusted for age, duration of low back pain episode, referred leg pain, and baseline STarT Back Screening Tool psychosocial subscale, NPRS, RMDQ, and EQ-5D-3L values.

[b] Based on established MIC criteria: ≥30% decrease from baseline for RMDQ and NPRS and a GPES score ≥3.

[c] Based on a cutoff RMDQ score ≥7.

Supplemental Table 3. Baseline characteristics of participants stratified by risk category						
	Low Risk		**Medium Risk**		**High Risk**	
	UC (n = 20)	**SPLIT (n = 154)**	**UC (n = 62)**	**SPLIT (n = 127)**	**UC (n = 33)**	**SPLIT (n = 51)**
Sociodemographic						
Age, y, mean (SD)	48.00 (11.04)	44.76 (11.50)	47.44 (11.60)	45.45 (11.74)	50.12 (10.45)	47.59 (12.48)
Female, No. (%)	7 (35.0)	85 (55.2)	32 (51.6)	82 (64.6)	20 (60.6)	36 (70.6)
BMI (kg/m^2), No. (%)						
Underweight or normal weight	11 (55.0)	67 (44.1)	23 (37.1)	46 (36.2)	12 (36.4)	15 (31.3)
Overweight or obesity	9 (45.0)	85 (55.9)	39 (62.9)	81 (63.8)	21 (63.6)	33 (68.8)
Marital status, No. (%)						
Lives alone	7 (35.0)	50 (32.5)	22 (35.5)	48 (37.8)	12 (36.4)	19 (37.3)
Lives with someone	13 (65.0)	104 (67.5)	40 (64.5)	79 (62.2)	21 (63.6)	32 (62.7)
Years of education, No. (%)						
0-9	5 (25.0)	58 (38.2)	31 (50.0)	65 (51.2)	24 (72.7)	33 (64.7)
≥ 10	15 (75.0)	94 (61.8)	31 (50.0)	62 (48.8)	9 (27.3)	18 (35.3)
Work status, No. (%)						
Active	16 (80.0)	113 (74.3)	48 (77.4)	86 (68.3)	25 (75.8)	26 (51.0)
Not working	4 (20.0)	39 (25.7)	14 (22.6)	40 (31.7)	8 (24.2)	25 (49.0)

Clinical						
Duration of LBP episode, No. (%)						
< 12 weeks	8 (40.0)	87 (57.2)	39 (62.9)	68 (53.5)	15 (45.5)	14 (27.5)
≥ 12 weeks	12 (60.0)	65 (42.8)	23 (37.1)	59 (46.5)	18 (54.5)	37 (72.5)
Referred leg pain, No. (%)	7 (35.0)	32 (21.1)	41 (66.1)	66 (52.8)	28 (84.8)	32 (62.7)
LBP pain medication, No. (%)	6 (30.0)	42 (28.4)	39 (62.9)	78 (61.9)	21 (63.6)	39 (76.5)
Sickness certificate, No. (%)	0 (0.0)	14 (9.3)	17 (27.4)	34 (27.2)	14 (42.4)	16 (32.0)
SBST psychosocial subscale (Q5 to 9, 0 to 5)	1.05 (0.69)	0.83 (0.84)	2.50 (0.62)	2.48 (0.64)	4.36 (0.49)	4.35 (0.48)
Back-related disability (RMDQ, 0 to 24)	6.60 (4.71)	3.90 (3.09)	12.50 (4.96)	11.50 (4.93)	16.52 (5.06)	14.06 (4.47)
Pain intensity (NPRS, 0 to 10)	3.85 (2.96)	2.38 (2.08)	5.34 (2.28)	4.74 (2.15)	6.48 (2.35)	5.92 (1.86)
HRQoL (EQ-5D-3L, 0 to 1)	0.58 (0.26)	0.75 (0.20)	0.45 (0.20)	0.51 (0.23)	0.33 (0.21)	0.41 (0.18)

BMI = body mass index; EQ-5D-3L = EuroQoL 5 dimensions 3 levels; HRQoL = health-related quality of life; LBP = low back pain; NPRS = Numerical Pain Rating Scale; RMDQ = Roland-Morris Disability Questionnaire; SBST = STarT Back Screening Tool; SPLIT = stratified primary care for low back pain; UC, usual care.

Note: Sample size was not consistent, owing to missing data. Low risk SPLIT: BMI (n = 152); Years of education (n = 152); Work status (n = 152); Duration of LBP episode (n = 152); Referred leg pain (n = 152); Pain medication (n = 148); Sickness certificate (n = 150). Medium risk SPLIT: Work status (n = 126); Referred leg pain (n = 125); Pain medication (n = 126); Sickness certificate (n = 125). High risk SPLIT: BMI (n = 48); Sickness certificate (n = 50).

Supplemental Table 4. Primary and secondary outcomes over the 6-month follow-up, stratified by risk category						
	Low Risk		**Medium Risk**		**High Risk**	
	UC	**SPLIT**	**UC**	**SPLIT**	**UC**	**SPLIT**
Back-related disability (RMDQ, 0 to 24)						
2 months: UC, n = 19, 59, 32; SPLIT, n = 140, 124, 51						
Mean (SD)	6.05 (5.03)	1.89 (2.60)	6.95 (5.75)	3.54 (4.16)	15.00 (5.84)	4.86 (4.72)
Achieved MIC, No. (%)[a]	7 (36.8)	96 (68.6)	40 (67.8)	103 (83.1)	7 (21.9)	41 (80.4)
Poor disability, No. (%)[b]	6 (31.6)	8 (5.7)	29 (49.2)	25 (20.2)	29 (90.6)	16 (31.4)
6 months: UC, n = 19, 56, 29; SPLIT, n = 131, 104, 46						
Mean (SD)	4.47 (4.78)	1.69 (2.45)	6.66 (5.43)	3.64 (4.53)	14.21 (6.91)	5.65 (5.82)
Achieved MIC, No. (%)[a]	11 (57.9)	95 (72.5)	35 (62.5)	82 (78.8)	7 (24.1)	33 (71.7)
Poor disability, No. (%)[b]	5 (26.3)	7 (5.3)	28 (50.0)	23 (22.1)	23 (79.3)	17 (37.0)
Pain intensity (NPRS, 0 to 10)						

2 months: UC, n = 19, 59, 32; SPLIT, n = 140, 124, 51						
Mean (SD)	3.00 (2.38)	1.19 (1.99)	3.17 (2.71)	1.81 (2.23)	5.72 (2.76)	2.10 (2.33)
Achieved MIC, No. (%)[a]	9 (47.4)	104 (74.3)	37 (62.7)	94 (75.8)	9 (28.1)	41 (80.4)
6 months: UC, n = 19, 56, 29; SPLIT, n = 131, 104, 46						
Mean (SD)	2.05 (2.66)	1.28 (2.00)	2.25 (2.73)	1.97 (2.72)	5.72 (3.21)	3.07 (3.07)
Achieved MIC, No. (%)[a]	11 (57.9)	91 (69.5)	41 (73.2)	75 (72.1)	8 (27.6)	29 (63.0)
Perceived effect of treatment (GPES, -5 to +5)						
2 months: UC, n = 19, 59, 32; SPLIT, n = 140, 124, 51						
Median (IQR)	2.0 (4.0)	3.0 (2.0)	3.0 (2.0)	4.0 (1.0)	0.0 (3.5)	4.0 (1.0)
Achieved MIC, No. (%)[a]	8 (42.1)	92 (65.7)	43 (72.9)	99 (79.8)	7 (21.9)	42 (82.4)
6 months: UC, n = 19, 56, 29; SPLIT, n = 131, 104, 46						
Median (IQR)	3.0 (4.0)	4.0 (2.0)	3.0 (4.0)	4.0 (2.0)	0.0 (7.0)	3.5 (2.0)

Achieved MIC, No. (%)[a]	10 (52.6)	100 (76.3)	36 (64.3)	79 (76.0)	10 (34.5)	34 (73.9)
HRQoL (EQ-5D-3L, 0 to 1)						
2 months: UC, n = 19, 59, 32; SPLIT, n = 139, 124, 51						
Mean (SD)	0.69 (0.24)	0.87 (0.17)	0.68 (0.26)	0.77 (0.24)	0.42 (0.21)	0.73 (0.22)
6 months: UC, n = 19, 56, 29; SPLIT, n = 131, 104, 46						
Mean (SD)	0.78 (0.23)	0.88 (0.19)	0.62 (0.19)	0.76 (0.25)	0.41 (0.27)	0.75 (0.24)

EQ-5D-3L = EuroQoL 5 dimensions 3 levels; GPES = Global Perceived Effect Scale; HRQoL = health-related quality of life; IQR = interquartile range; MIC = minimal important change; NPRS = Numerical Pain Rating Scale; RMDQ = Roland-Morris Disability Questionnaire; SD = standard deviation; UC = usual care.

[a] Based on established MIC criteria: ≥30% decrease from baseline for RMDQ and NPRS and a GPES score ≥3.

[b] Based on a cutoff RMDQ score ≥7.