TECHNICAL GUIDELINE

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ANAMT Technical Guideline (DT 05): prevention of occupational low back pain through back belts, lumbar support or braces

Diretriz Técnica da ANAMT (DT 05): prevenção de lombalgia ocupacional por uso de cinta, suporte ou órtese lombar

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ABSTRACT | Background: Low back pain is a considerable global public health problem. Use of back belts in occupational settings arises from the expectation of countless biomechanical benefits, which together would contribute to the prevention of this problem. **Objective:** To orient students, physicians and health institutions on the use of back belts, lumbar support or braces for prevention of low back pain or injury among asymptomatic workers. **Method:** The present guideline was developed based on a systematic literature review; 809 studies were located in database MEDLINE and 571 in EMBASE and Cochrane CENTRAL. Evaluating back-belt use as preventive intervention against low back pain demands quantifying benefits, harms and difficulties to implementation, as well as the methodological quality of primary studies. **Conclusion:** Despite the weak benefits reflected in the individual, partial and isolated results of a few studies, there is no consistent evidence for the use of back belts, lumbar supports or braces for primary prevention of low back pain or occupational low back injury among workers. According to the available evidence, back-belt use is not associated with reduction of absenteeism.
Keywords | orthotic devices; primary prevention; low back pain.

RESUMO | Introdução: Lombalgia é um problema internacional importante de saúde pública. O uso de cinta lombar no meio ocupacional emerge da expectativa de inúmeros benefícios biomecânicos que, em conjunto, promoveriam a prevenção desse problema. **Objetivo:** Orientar estudantes, médicos e estabelecimentos de saúde sobre o uso de cinta lombar, suporte ou órtese lombar como prevenção da lombalgia ou de lesões lombares em trabalhadores sem sintomatologia atual. **Método:** Ela foi desenvolvida a partir da revisão sistemática da literatura: da base de dados MEDLINE, foram recuperados 809 trabalhos e das bases EMBASE e Central Cochrane, 571. Avaliar a cinta lombar como intervenção preventiva de lombalgia envolve a quantificação de benefícios, malefícios e facilidade de sua implementação, assim como a qualidade metodológica dos estudos primários. **Conclusão:** Apesar do benefício demonstrado fracamente em resultados individuais, parciais e isolados em poucos estudos, não há evidência consistente que sustente a utilização de cinta lombar, suporte ou órtese lombar na prevenção primária da lombalgia ou de lesões lombares ocupacionais em trabalhadores. As evidências, agrupadas, apontam para ausência de redução de absenteísmo com o uso da cinta lombar.
Palavras-chave | aparelhos ortopédicos; prevenção primária; dor lombar.

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OBJECTIVE

To establish the efficacy of back-belt use as method for primary prevention of occupational low back pain.

DEGREES OF RECOMMENDATION AND STRENGTH OF EVIDENCE

A: experimental or observational studies with better consistency;
B: experimental or observational studies with less consistency;
C: case reports/uncontrolled studies;
D: opinions without critical assessment, based on consensus, physiological studies or animal models

INTRODUCTION

Low back pain is a considerable global public health problem. A systematic review published in 2015 by Brazilian authors compiled national and international studies on the prevalence of chronic low back pain. The global prevalence of chronic low back pain is estimated as 4.2% among individuals aged 24 to 39 years old, and 19.6% among the ones 20 to 59 years of age. Among Brazilian older adults, the estimated prevalence is 25.4%[1]. According to another systematic review published in 2017, low back pain is a significant complaint in emergency departments, corresponding to 4.39% of the patients seen[2].

Other systematic reviews analyzed the prevalence of low back pain or spine disorders among specific populations of workers. Degenerative lumbar spine disease affects 19% (544 out of 2,449) surgeons or interventionists[3], has an annual prevalence of 17 to 94% among athletes[4], and was found among 51.1% of civil construction workers[5]. According to the 2016 Social Security Statistical Yearbook, dorsalgia (ICD M54) represented 6.15% of occupational diseases, ranking third in prevalence[6].

Several individual risk factors were associated with low back pain in systematic reviews, which reinforces the preventive role of occupational medicine in the control of individual risk factors related to low back pain, such as obesity[7,8], smoking[9] and depression[10].

In regard to occupational risk factors, a systematic review of prospective studies published in 2014 found a statistically significant relationship between low back pain and biomechanical factors: odds ratio (OR) 1.11 (95% confidence interval–CI 1.05–1.18) per 10 kg lifted and OR 1.09 (95%CI 1.03–1.15) per 10 lifts/day. The authors estimated that lifting loads over 25 kg and lifting at a frequency of 25 lifts/day increases the annual prevalence of low back pain by 4.32 and 3.50%, respectively[11].

The use of back belts in occupational settings derives from the expectation of countless biomechanical benefits which together might prevent the occurrence low back pain: redistribution of spinal forces during lifting as a result of increased intrabdominal pressure, decreased muscle fatigue and biomechanical strain as a result of increased muscle support, decreased range of motion, improved posture, and a sense of safety[12].

DISCUSSION

Assessment of back belts as preventive intervention against low back pain requires quantifying benefits, harms and difficulties to implementation, as well as analysis of the methodological quality of primary studies. For the present guideline, we selected a systematic review[13], five clinical trials[14-18], and five observational studies[19-24].

Studies on low back pain should face the methodological challenge posed by the need for a consistent selection of study populations, which not seldom exhibit heterogenous health profiles, comorbidities, etiology, frequency, pain severity and job activities. These factors hinder the assessment of the purely preventive value of back belts, as well as the generalization of results. This heterogeneity reinforces the relevance of the quality of randomization in clinical trials in a way to homogenize such factors. The level of the evidence resulting from cohort studies tends to be lower compared to randomized clinical trials precisely due to the lack of random allocation.

None of the analyzed clinical trials exclusively included participants without history of low back pain, and thus all of them investigated combinations of primary and secondary low back pain prevention[13] (A). Five studies reported to have included workers with history of low back pain[13-17] (A), while two did not provide information on the history or current state of low back pain[13,18] (A). All the cohort studies included participants with history of low back pain.

This factor is a consistent predictor of relapse[25] (A) which might thus potentially influence the prevalence of low back pain found in studies.

In regard to the job activities considered in the clinical trials, two studies recruited populations of home care attendants[14,15] (A), one warehouse workers[18] (A), and two airline baggage handlers[16,17] (A). The cohort studies included supermarket employees[19] (B), employees in the retail-trade home improvement industry[20] (B), forklift workers[21] (B), hospital employees[22] (B), and a military population[23] (B).

The methodological quality of most of the selected clinical trials was limited[13] (A). In the studies by Walsh and Schwartz[18] (A), Roelofs et al.[14] (A) and van Poppel et al.[16] (A) the random sequence generation was adequate. Only in the studies by Roelofs et al.[14] (A) and van Poppel et al.[16] (A) allocation was adequately concealed. The study by Kraus et al.[15] (A) did not randomize individuals, but nine home care agencies to the control and intervention groups. In none of the studies the participants or outcome examiners could be blinded to intervention, which is relevant for ruling out placebo effect[13] (A).

As to the benefits measured in the analyzed studies, Chart 1 summarizes the results of the clinical trials and Chart 2 the ones of the observational studies (Appendix 1).

Absenteeism is a relevant outcome, because it is an indirect indicator of severe low back pain and reflects changes in the natural history of disability. None of the clinical trials investigated statistically significant or considerable reduction of absenteeism. Low adherence to back-belt use reduced the statistical power of the studies conducted by Reddell et al.[17] (A) and van Poppel et al.[16] (A). Walsh and Schwartz[18] (A) found significant reduction of absenteeism

Chart 1. Results of clinical trials.

Author	Year	Population	Measured outcomes
Walsh and Schwartz[18]	1990	Control group: n=27 Training: n=27 Training + lumbar support=27	Adherence was not reported. There was not statistically significant difference in the occupational low back injury rate or productivity between the groups. There was statistically significant (p=0.03) reduction of 2.46 days favorable to group training + lumbar support after 6-month follow-up. Among the participants with previous history of back pain, absenteeism significantly decreased by 5.9 days, on average, along 6 months. Participants complained that the belt was too hot. Use of back belts did not interfere with the abdominal muscles.
Reddell et al.[17]	1992	Control group: n=248 Training: n=122 Lumbar support: n=145 Training + lumbar support=127	58% of the participants discontinued the use of back belts before the completion of the 8-month period, and were reclassified to another groups. Such lack of adherence decreased the study power. There was not significant difference in the incidence of occupational low back injury, days of work with restrictions or absenteeism. Harms reported in association with the use of belts were thermal and physical discomfort.
van Poppel et al.[16]	1998	Control group: n=77 Training group: n=82 Lumbar support: n=83 Training + lumbar support: n=70	43% of participants adhered to the use of lumbar support after 12-month follow-up. There was no statistically significant association between use of back belts and reduction of the incidence of low back pain or absenteeism.
Kraus et al.[15]	2002	Control group: n=4.531 Training: n=4.133 Lumbar support n=3.744	92.2% of the participants adhered to the use of lumbar support along the 28-month study period. Relative to the incidence of low back pain, lumbar support exhibited RR=1.36 (95%CI 1.02–1.82) favorable compared to the controls. There was no significant difference between groups back belt and training, RR=1.18 (95%CI 0.87–1.59).
Roelofs et al.[14]	2007	Control group: n=177 Lumbar support: n=183	78% of participants adhered to the use of lumbar support, which was used 5.5 days per month, on average. The satisfaction level was 74%. In regard to the incidence of low back pain, there was difference favorable to group lumbar support, of -52.7 (95%CI -59.6–-45.1) days/year. There was significant, but small benefit in regard to the severity of pain, score -0.6 (95%CI -1.0–-0.1; p=0.020) and function, score -4.1 (95%CI -7.5–-0.8; p=0.017). There was not significant benefit in terms of reduction of absenteeism, -5 days/year (95%CI -21.1–6.8). 6% of the participants reported physical and thermal discomfort.

of just 2.6 days. Among the selected cohort studies, only the one by Mitchell et al.[23] (B) analyzed absenteeism as outcome of interest, which was nonsignificant among the participants without history of low back pain.

In regard to the incidence of low back pain, Kraus et al.[15] (A) and Roelofs et al.[14] (A) analyzed statistically significant reduction of pain, the results being favorable to the group that used back belts. In the study by Kraus et al.[15] (A), the benefit was only marginally significant, rate ratio (RR) 1.36 (95%CI 1.02–1.82), which reduced the odds of clinical relevance of the measured benefit. In the study by Roelofs et al.[14] (A) discrete reduction of incidence with the use of back belts, of -52.7 (95%CI -59.6–-45.1) days per year, was attended by discrete reduction of the intensity of pain and improvement of functioning. However, these benefits did not result in significant decrease of absenteeism.

Among the cohort studies, only the one by Wassel et al.[19] (B) was prospective and had a reasonable sample size. These authors did not measure benefits after six-month follow-up of black-belt users versus non-users in a population of workers. The study by de Kraus et al.[20] (B) found difference in the occurrence of occupational low back injury between back-support users and non-users of 10.4 per million working hours, RR=1.52 (95%CI 1.36–1.69). These authors did not analyze degree of adherence, absenteeism, severity of pain or concomitant influence of other interventions.

As to harms, the analyzed studies only considered isolated reports of physical or thermal discomfort. Using back belts was not associated with impaired muscle strength[13], (A)[24] (B).

Adherence to back-belt use was heterogeneous among the clinical trials, varying from 43 to 92%. However, the methods to assess adherence are not independent from the participants' memory and subjectivity when questionnaires are administered. Only the study by Roelofs et al.[14] (A) consistently measured adherence to back-belt use by

Chart 2. Results of observational studies.

Author	Year	Population	Measured outcomes
Thompson et al.[22]	1994	Back support+ back training program: n=41 Back training program: n=19	After 3 month-follow up low back pain significantly decreased in the group who used back belts, but of uncertain degree
Mitchell et al.[23]	1994	Retrospective cohort study that analyzed the association of risk factors and back-belt use with occupational low back pain based on a retrospective questionnaire administered to 1,316 airport warehouse workers; history of occupational low back pain from 1985 to 1991	Back-belt use was marginally significant as protective against first injury, p=0.508, OR 0.60 (95%CI 0.36–1.0). The prevalence of occupational low back injury was 28.6/1,000 among back-belt users vs. 26.9/1,000 among non-users. Among the participants without previous history of low back pain, absenteeism was 187.9/1,000 for back-belt users vs. 393/1,000 for non-users. However, the number of days of work with restrictions was higher among back-belt users, 2,324.4 days, vs. 922.9 days/1,000 for non-users
Kraus et al.[20]	1996	This study compared the number of recorded cases of occupational low back injury per working hours using vs. not using back belts adjusted for full-time equivalent along 6 years	Occupational low back injury rate of 30.6 per million working hours among without back-belt use vs. 20.2 per million working hours after back-belt use implementation; reduction rate of 34%, RR 1.52 (95%CI 1.36–1.69). Adherence, absenteeism and pain severity were not analyzed
Wassell et al.[19]	2000	Required back belt use at baseline: n=5,251 Voluntary back belt use at baseline: n=4,215 4 subgroups were established according to frequency of back-belt use and job activities	Independently from frequency of use, history of low back pain, job activity, voluntary or required use, there was not significant difference in the prevalence of low back pain or occupational low back injury between back-belt users and non-users along 6-months. Absenteeism was not analyzed
Shinozaki et al.[21]	2001	Back support + exercise: n=27 forklift workers Control group: n=55 management employees Control group: n=233 copper smelters	After 12-month follow-up, there was non-significant reduction of the prevalence of low back pain, from 17 to 15 participants. No change was detected in the control groups. Following ergonomic improvements to reduce vibration, there was significant reduction to 9 workers (p=0.008)

means of individual diaries; yet, back belts were used just 5.5 days per month, on average.

CONCLUSION

The scientific evidence gathered consistently points to lack of benefit in terms of reduction of absenteeism with the use of back belts. Preventive benefits relative to the prevalence and severity of low back pain were not consistent among the analyzed studies, having isolated and marginally significant results in some studies.

It is worth calling the attention to the difficult application of the notion of primary prevention vis-à-vis the available evidence, given the high frequency of inclusion of populations with and without history of low back pain in the analyzed studies.

Our conclusions agree with the ones of other systematic reviews on the subject of interest[13,26], as well as with the institutional scientific position of *National Institute for Occupational Safety and Health* (NIOSH)[27] (D) and *Canadian Centre for Occupational Health and Safety* (CCOHS)[28] (D).

RECOMMENDATION

Despite the weak benefits reflected in the individual, partial and isolated results of a few studies, there is no consistent evidence grounding the use of back belts, lumbar support or braces for primary prevention of low back pain or occupational low back injury among workers. The available evidence indicate lack of reduction of absenteeism in association with the use of back belts.

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APPENDIX 1 – METHODS

1. Clinical question

Does using back belts, lumbar support or braces (primarily) prevent the occurrence of low back pain or injury among workers currently without any symptom?

2. Eligibility criteria

Inclusion

- PICO components (P — population or problem, I — intervention, C — control, and O — outcome);
- Randomized clinical trials; observational cohort studies; systematic review with or without meta-analysis (the latest);
- Without language or time restrictions;
- Full-text available or abstract describing the necessary data.

Exclusion

- Population outside occupational environments or settings;
- Studies on the treatment of low back pain or injury.

3. Article search

Databases

The search began on 20 April 2017 for relevant articles, based on their title and abstract. The selected articles were subjected to full-text analysis for relevance vis-à-vis the research question. The articles retrieved from all the searched databases were reunited, and two investigators analyzed their methodological quality. Articles with poor methodological quality could be excluded in this stage.
Figure 1 depicts the absolute number of articles retrieved from each database, the ones selected for review, and the included and excluded ones.

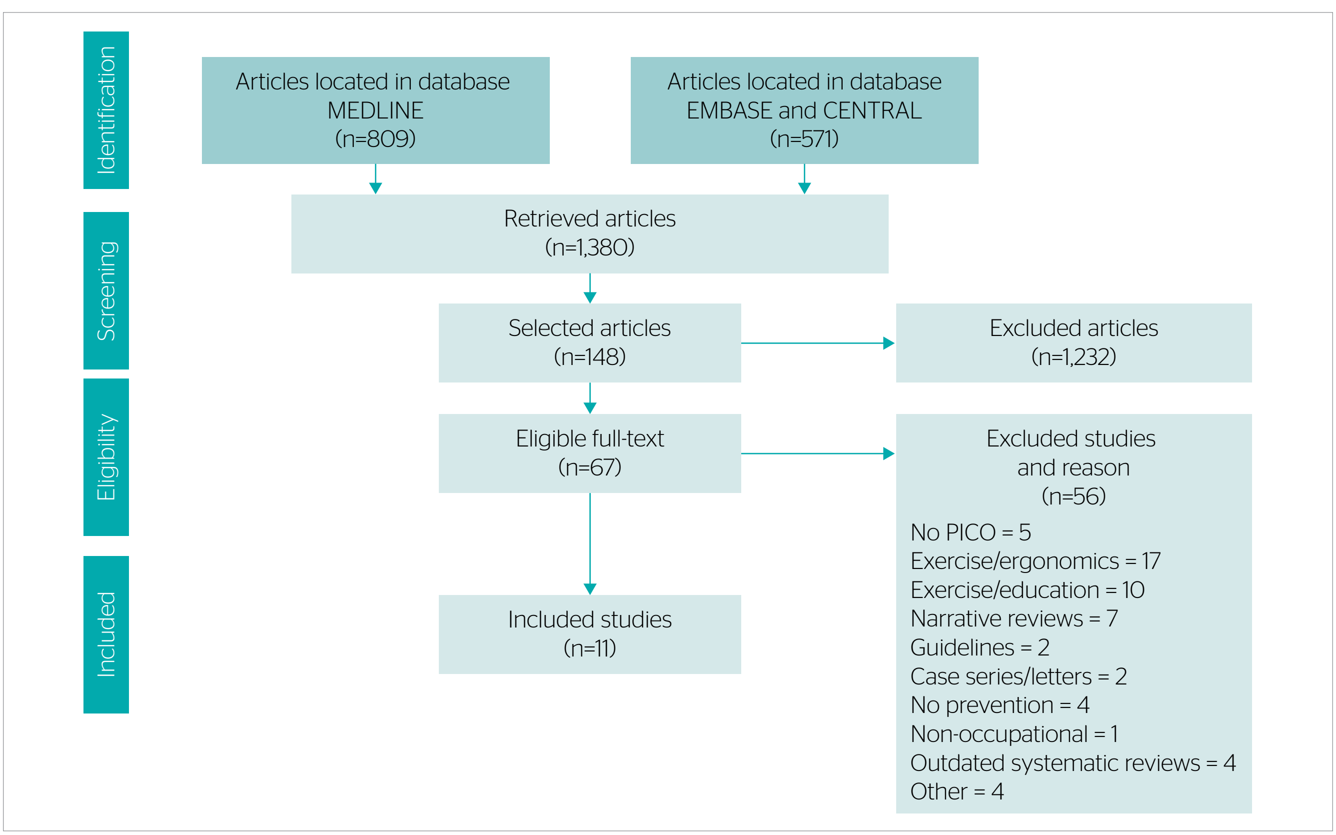

Figure 1. Absolute number of retrieved articles per database, articles selected for review, and included and excluded articles.

Descriptors

P	Adult patient in an occupational setting (worker) without any current symptom of low back pain
I	Use of back belt, lumbar support or braces in the workplace
C	Usual care, no intervention or other preventive measures (education, exercise)
O	Low back pain, low back injury, function, absenteeism, sick leave

Search strategy
#1 (*Occupational diseases OR workplace OR worksite OR worker OR workers OR work or working*);
#2 (*Low back pain OR lumbago OR low back injury OR lumbar injury*);
#3 (*Protective devices OR belts OR belt OR support OR devices*);
#4 (*prevention and control*) OR (*prevention & control**).
(*Occupational diseases OR workplace OR worksite OR worker OR workers OR work or working*) AND (*low back pain OR lumbago OR low back injury OR lumbar injury*) AND (*protective devices OR belts OR belt OR support OR devices*) AND ((*prevention and control*) OR (*prevention & control**).

4. Critical assessment

The research question was framed according to the PICO process. Based on this format and Descritores em Ciências da Saúde (DeCS — Health Science Descriptors) and synonyms we defined the search strategy for each database.
Levels of evidence were established per study type according to the Oxford classification[29].

5. Methods for data extraction and analysis of results

From the evidence included we extracted the data needed to ground, in a document, recommendations answering the clinical question as a function of the characteristics of patients and interventions, comparisons and the outcomes established in the eligibility criteria.

6. Results

The search for scientific information allowed retrieving 809 studies from database MEDLINE and 571 from EMBASE and Cochrane CENTRAL. Following application of the eligibility criteria and removal of duplicates, 67 articles were selected based on their titles and abstracts for full-text analysis. Further 55 articles were excluded for the following reasons: did not comply with the PICO frame (6); exercise/ergonomics (17); exercise/education (10); narrative reviews (7); guidelines (2); case series/editorials (2); not focused on prevention (4); non-occupational (1); outdated systematic reviews (4); other (3). Therefore, 11 studies were selected (5 randomized clinical trials, 1 systematic review and 5 observational cohort studies) to ground the present guideline (Figure 1).

7. Evidence application — recommendation

The recommendations were made by the authors of the present technical guideline, considering the characteristics of the synthesized evidence. The recommendations were subjected for validation to all the members of our working group. The degree of recommendation directly derives from the strength of evidence the included studies as per the Oxford classification[29] and the GRADE system[30].

8. Conflict of interests

The authors declare there is no conflict of interests in regard to the present review.