

# Management of penetrating extraperitoneal rectal injuries: An Eastern Association for the Surgery of Trauma practice management guideline

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<b>BACKGROUND:</b>	The management of penetrating rectal trauma invokes a complex decision tree that advocates the principles of proximal diversion (diversion) of the fecal stream, irrigation of stool from the distal rectum, and presacral drainage based on data from World War II and the Vietnam War. This guideline seeks to define the initial operative management principles for nondestructive extraperitoneal rectal injuries.
<b>METHODS:</b>	A systematic review of the MEDLINE database using PubMed was performed. The search retrieved English language articles regarding penetrating rectal trauma from January 1900 to July 2014. Letters to the editor, case reports, book chapters, and review articles were excluded. Topics of investigation included the management principles of diversion, irrigation of stool from the distal rectum, and presacral drainage using the GRADE methodology.
<b>RESULTS:</b>	A total of 306 articles were screened leading to a full-text review of 56 articles. Eighteen articles were used to formulate the recommendations of this guideline.
<b>CONCLUSION:</b>	This guideline consists of three conditional evidence-based recommendations. First, we conditionally recommend proximal diversion for management of these injuries. Second, we conditionally recommend the avoidance of routine presacral drains and distal rectal washout in the management of these injuries. ( <i>J Trauma Acute Care Surg.</i> 2016;80: 546–551. Copyright © 2016 Wolters Kluwer Health, Inc. All rights reserved.)
<b>KEY WORDS:</b>	Rectal injury; practice management guideline; extraperitoneal; penetrating.

The management of penetrating rectal trauma invokes a complex decision tree that has been established based on lessons learned in wartime. The classic teaching for the management of penetrating rectal trauma advocates the principles of proximal diversion (diversion) of the fecal stream, irrigation of stool from the distal rectum (DRW), and presacral drainage (PD). Today, these techniques are used variably by clinicians based on the available literature that has been published during the last 40 years. In the development of this guideline, management principles were concerned specifically with those injuries most commonly seen in civilian trauma, specifically low-velocity rectal wounds. In terms of nomenclature, these would be considered

nondestructive injuries. Nondestructive rectal injuries have been defined as those with less than 25% loss of circumference.<sup>1</sup> In addition, this practice management guideline addresses the anatomic location of the injury as being extraperitoneal, and we recommend that intraperitoneal injuries should be managed as any other colon injury.<sup>2</sup>

## OBJECTIVES

The objective of this guideline was to evaluate the use of diversion, DRW, and PD in nondestructive penetrating extraperitoneal rectal injuries. The Population (P), Intervention (I), Comparator (C) and Outcome (O) questions were defined as follows:

### PICO Question 1

In patients with nondestructive penetrating extraperitoneal rectal injuries (P), should proximal diversion (I) be performed versus no proximal diversion with primary repair (if feasible) (C) to decrease the incidence of complications (O)?

### PICO Question 2

In patients with nondestructive penetrating extraperitoneal rectal injuries (P), should presacral drainage (I) versus no presacral drainage (C) be performed to decrease the incidence of complications (O)?

### PICO Question 3

In patients with nondestructive penetrating extraperitoneal rectal injuries (P), should distal rectal washout be performed (I)

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versus no distal rectal washout (C) to decrease the incidence of complications (O)?

## IDENTIFICATION OF REFERENCES

With the assistance of a professional medical librarian, a search of the National Library of Medicine and the National Institutes of Health MEDLINE database was conducted using PubMed and IndexCat, as well as proprietary indices hosted by Elsevier (Scopus) and EBSCO (CINAHL) with citations published between January 1900 and July 2014. We used the “related articles” function to broaden the search and scan all citations for relevance. In addition to the electronic search, we manually searched the bibliographies of recent reviews and articles. Articles were limited to those in the English language involving human subjects. A systematic review of the available databases using PubMed, IndexCat, Scopus, and CINAHL was performed with the following search terms: *rectum, rectal, anorectal, trauma, wound, injury, penetrating, firearm, gunshot, stab, impale, and human*. Letters to the editor, single-case reports, book chapters, and review articles were excluded. Articles that focused specifically on injuries related to combat were excluded. In addition, pediatric literature was included in the search; however, none of the data addressed the PICO questions. Of the 306 articles identified, 250 were eliminated for not relating to the PICO questions or not meeting inclusion criteria. The remaining 56 articles were each reviewed by two committee members to determine eligibility in this review. This resulted in 18 articles meeting inclusion criteria and addressing the PICO questions that had been formulated to create these guidelines (Fig. 1).

## OUTCOME MEASURE TYPES

As per the GRADE approach, outcomes were chosen by the committee and rated in importance from 1 to 9, with scores of 7 to 9 representing critical outcomes (Table 1). For all PICO questions, the following outcomes were considered by committee members: mortality, sepsis, intra-abdominal infection,

TABLE 1. Ranking of Outcomes

Outcome	Average	Importance	Include in GRADE Evidence Profile
Mortality	8.7	Critical	Yes
Sepsis	8.3	Critical	Yes
Intra-abdominal infection	7.8	Critical	Yes
Postoperative intervention	6.1	Important	No
Fistula	5.8	Important	No
Bleeding	5.3	Important	No
Stoma complications	4.8	Important	No
Soft tissue infection	3.0	Less important	No
Incontinence	3.0	Less important	No
Antibiotic length of time	2.3	Less important	No
Antibiotic complications	2.3	Less important	No

postoperative intervention, fistula development, bleeding complications, stoma complications, soft tissue infection, incontinence, antibiotic timing, and antibiotic complications.

The outcomes deemed critical by vote of the committee included mortality, sepsis, and intra-abdominal infection. Unfortunately, sepsis and intra-abdominal infection were not uniformly delineated in the identified studies; thus, the committee combined these two outcomes into infectious complications. The remainder of the outcomes were considered not critical by the committee and were not used in the decision-making process.

## DATA EXTRACTION AND METHODOLOGY

Following identification of the potentially pertinent 56 articles, each article was assigned to two committee members for extraction of data for each PICO in question. Because of the small numbers reported as well as heterogeneity and variability in reporting of data among the articles, meta-analysis was not practical for this guideline. Of the articles that were identified, only two were prospective, one observational<sup>1</sup> and one randomized.<sup>3</sup>

### PICO Question 1

Fourteen articles were identified which addressed PICO Question 1.<sup>1,3–17</sup> Data reported for mortality and infectious complications were pooled to determine overall rates. Intrinsic limitations of the data existed because of heterogeneity, non-standardized study designs, and incomplete reporting of complications. In addition, several studies did not delineate between intraperitoneal and extraperitoneal injuries.

### PICO Question 2

Seventeen articles were reviewed by the committee from which data were extracted to address PICO Question 2.<sup>1,3–6,8–19</sup> Similarly to PICO Question 1, data reported for the outcomes of mortality and infectious complications were pooled to determine overall rates. The same limitations seen with PICO Question 1 existed.

### PICO Question 3

Thirteen articles were available to address PICO Question 3.<sup>1,5–12,14–17</sup> The data obtained for the outcomes of mortality and infectious complications were pooled to determine

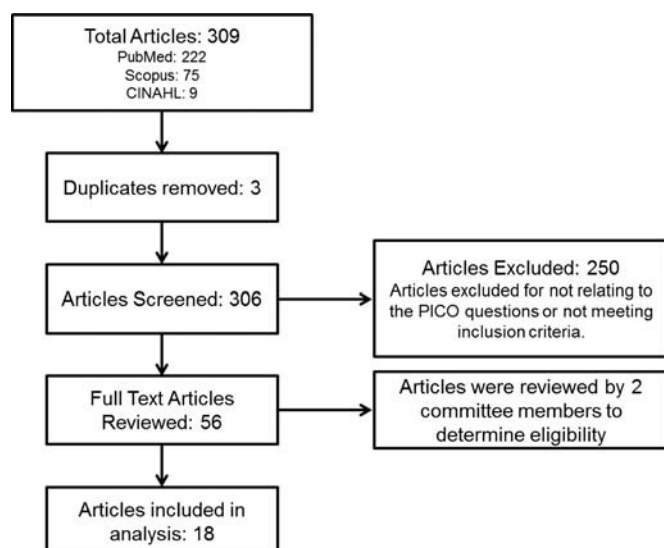


Figure 1. Study selection flow diagram.

overall rates. This data set was limited similarly to the data for PICO Questions 1 and 2.

## RESULTS FOR PICO QUESTION 1

In patients with nondestructive penetrating extraperitoneal injuries (P), should proximal diversion (I) be performed versus primary repair (if feasible) without proximal diversion (C) to decrease the incidence of infectious complications (O) (Table 2)?

## Qualitative Synthesis

Proximal diversion has been considered the hallmark of management for penetrating rectal injuries since World War II. The literature comparing diversion versus nondiversion is significantly lacking in the present literature pool. Upon this review, 14 studies have taken into consideration the critical outcomes of mortality and infectious complications in the setting of proximal diversion. The nondiversion comparator group is quite small (26 patients) versus the diversion group (532 patients). Only one study was prospective in nature for this PICO, which had a small number of participants.<sup>1</sup> In that study, Gonzalez et al. assigned 14 patients to one of two algorithms for the treatment of nondestructive extraperitoneal rectal injuries, neither of which involved colostomy formation. No patient in the study had an infectious complication related to the rectal injury, and there was no mortality. This one study represents more than half of the patients (14 of 26) identified in the literature treated without colostomy for extraperitoneal rectal injuries. Overall, there is no reported mortality in the nondiversion group (0 of 26), while the diversion group has a mortality rate of 1.7% (9 of 523). Unfortunately, it is unclear as to whether death in these patients was specifically related to the complications of the rectal injury or is related to overall trauma burden to include hemorrhagic shock. Regarding the second critical outcome of infectious complications, the diversion group had nearly a 50% reduction (diversion, 8.8% vs. nondiversion, 18.2%) of overall infectious complications.

## Quantitative Synthesis (Meta-analysis)

Meta-analysis was not appropriate because of the small numbers reported, as well as heterogeneity and variability in the reporting of data among the articles.

## Grading the Evidence

The overwhelming majority of data related to this PICO question was retrospective and observational in nature. With the use of the GRADE framework for evaluating the data related to the outcomes of mortality and infectious complications, the quality of the data for this specific PICO question suffers because of risk of bias and imprecision. Bias was assigned because of the majority of the studies use historical controls. Imprecision was determined because of the very low numbers of events seen within the comparator group. Because of these factors, the overall quality of evidence has been determined to be very low.

## Recommendation

Within the GRADE framework, once the overall quality of evidence across studies and outcomes is determined, the guideline panel formulates a recommendation that considers the following: quality of evidence, balance between desirable and undesirable outcomes, patients' values and preferences,

**TABLE 2.** PICO Question 1: Should Primary Repair Without Proximal Division Versus Standard Proximal Division Be Used for Nondestructive Penetrating Extraperitoneal Injuries?<sup>1,3-19</sup>

Quality Assessment							Summary of Findings			
Participants (Studies) Follow-up	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Overall Quality of Evidence	Study Event rates (%)		Anticipated Absolute Effects	
							With Standard Proximal Diversion	With Primary Repair Without Proximal Diversion	Relative Effect (95% CI)	Risk with Standard Proximal Diversion
Mortality (critical outcome)										
549 (14 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	⊕⊕⊕⊕ Very low***† due to risk of bias, imprecision	9/523 (1.7%)	0/26 (0%)	NA‡	17 per 1,000 17 fewer per 1,000
Infectious complications (critical outcome)										
511 (14 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	⊕⊕⊕⊕ Very low***† due to risk of bias, imprecision	43/489 (8.8%)	4/22 (18.2%)	NA‡	88 per 1,000 94 more per 1,000
*Historical controls only. **Inconsistency could not be adequately assessed. †Few events; total patients enrolled in the intervention group low. ‡No reliable relative comparative effect estimate available because of comparison with historical controls.										

and cost/resource use. Despite the overall quality of evidence being very low, the panel considered that most patients would place a high value on avoidance of mortality and infectious complications. All of these factors resulted in the formulation of a conditional recommendation by the committee. The committee concludes that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects. Thus, in patients with nondestructive penetrating extraperitoneal rectal injuries, we conditionally recommend proximal diversion (vs. nondiversion).

## RESULTS FOR PICO QUESTION 2

In patients with nondestructive penetrating extraperitoneal rectal injuries (P), should presacral drainage (I) versus no presacral drainage (C) be performed to decrease incidence of infectious complications (O) (Table 3)?

### Qualitative Synthesis

Advocated for the management of penetrating rectal injuries since World War II, the use of PD began to significantly decline after Gonzalez et al.<sup>3</sup> reported in a small, albeit important, randomized prospective study involving 50 patients randomized to two arms, of which the first was diversion and PD and the other was diversion and no PD. Two patients died of complications unrelated to the rectal injury. Therefore, 23 patients underwent PD, and 25 patients underwent no PD. There was no statistical difference in complications between the groups.

Upon formulation of this guideline, 17 studies have addressed the critical outcomes of mortality and infectious complications in the setting of presacral drainage. The no presacral drainage comparator group had a total of 267 patients versus the presacral drainage group of 395 patients. Overall mortality in the presacral drainage group was 1.77% versus 0.75% in the group without presacral drain. Similar to PICO Question 1, the pooled data are not clear as to whether death is specifically related to the management of the rectal injury or if death is related to overall trauma burden from associated injuries and hemorrhage, which seems likely. Regarding the second critical outcome of infectious complications, the no presacral drain group had a 40% reduction of overall infectious complications (no PD, 5.71% vs. PD, 9.63%).

### Quantitative Synthesis (Meta-analysis)

Meta-analysis was not appropriate because of the small numbers reported, as well as heterogeneity and variability in the reporting of data among the articles.

### Grading the Evidence

With the use of the GRADE framework for evaluating the data related to the outcomes of mortality and infectious complications, one randomized prospective study was specific to this PICO, question, which represented approximately 7% of the total pooled data, with the remainder of the data being retrospective and observational in nature. No serious inconsistency was detected; however, serious concerns for risk of bias and imprecision were noted among the representative studies. The inconsistency in study design and data reporting lowered the grade for this PICO. Therefore, the overall quality of evidence was considered very low by the committee.

**TABLE 3.** PICO Question 2: Should No Presacral Drainage Versus Routine Presacral Drainage Be Used for Penetrating Extraperitoneal Rectal Injuries?<sup>1,3-6,8-19</sup>

Participants (Studies) Follow-up	Quality Assessment					Summary of Findings			
	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Overall Quality of Evidence	Study Event Rates (%)		
							With Standard Presacral Drainage	With No Presacral Drainage	Risk with Standard Presacral Drainage (95% CI)
Mortality (critical outcome) 653 (17 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	⊕⊕⊕⊕ Very low***† due to risk of bias, imprecision	7/388 (1.8%)	2/265 (0.75%)	18 per 1,000
Infectious complications (critical outcome) 619 (17 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	⊕⊕⊕⊕ Very low***† due to risk of bias, imprecision	36/388 (9.3%)	14/231 (6.1%)	93 per 1,000

\*Historical controls only

\*\*Inconsistency could not be adequately assessed.

†Few events; total sample size not sufficiently high.

‡No reliable relative comparative effect estimate available because of comparison with historical controls.



## Recommendation

In patients with nondestructive extraperitoneal rectal injuries, we conditionally recommend against the routine use of presacral drains.

## RESULTS FOR PICO QUESTION 3

In patients with nondestructive penetrating extraperitoneal rectal injuries (P), should distal rectal washout be performed (I) versus no distal rectal washout (C) to decrease the incidence of infectious complications (O) (Table 4)?

## Qualitative Synthesis

Distal washout of stool from the rectum after penetrating wounds is a historical staple of management for rectal injuries. Many clinicians today have eliminated this component of management from their practices. Thirteen studies were included to adjudicate this PICO question. The non-DRW comparator group contained 301 patients versus the DRW group of 202 patients. Mortality for the group non-DRW group was 1.37% versus 0.99% in the DRW group. Like all PICO questions, the data are not clear as to whether death was related to the rectal injury management or if death is related to overall trauma burden from associated injuries. The second critical outcome of infectious complications demonstrated no difference between the groups (non-DRW, 10.30% vs. DRW, 9.90%).

## Quantitative Synthesis (Meta-analysis)

Meta-analysis was not appropriate because of the small numbers reported, as well as heterogeneity and variability in the reporting of data among the articles.

## Grading the Evidence

With the use of the GRADE framework for evaluating the data related to the outcomes of mortality and infectious complications, there was only one prospective observational study for this PICO, and this article included small numbers of participants (14 patients) that were not managed with DRW, without a comparator group.<sup>1</sup> The overwhelming data related to this PICO question were retrospective and observational in nature. No serious risk of bias was detected; however, inconsistency among the studies in design and data reporting lowered the grade for this PICO question. Therefore, the overall quality of evidence was considered very low by the committee.

## Recommendation

In patients with nondestructive penetrating extraperitoneal rectal injuries, we conditionally recommend not performing distal rectal washout (vs. performance of distal rectal washout).

## Using These Guidelines in Clinical Practice

These guidelines represent a detailed summary and comprehensive overview of the literature regarding the evaluation and treatment of penetrating extraperitoneal rectal injuries. The literature available for review conditionally supports the use of proximal diversion for avoidance of infectious complications. Furthermore, the literature supports a conditional recommendation for not performing presacral drainage and distal rectal washout to avoid infectious complications. The recommendations are meant to inform the decision-making process and not

**TABLE 4.** PICO Question 3: Should No Distal Rectal Washout Versus Standard Distal Rectal Washout Be Used for Penetrating Extraperitoneal Rectal Injuries?<sup>1,5-12,14-17</sup>

Participants (Studies) Follow-up	Risk of Bias	Quality Assessment				Summary of Findings			
		Inconsistency	Indirectness	Imprecision	Publication Bias	Study Event Rates (%)		Anticipated Absolute Effects	
						With Standard Distal rectal Washout	With No Distal rectal Washout	Relative Effect (95% CI)	Risk Difference with No Distal Rectal Washout (95% CI)
Mortality (critical outcome) 487 (13 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	2/200 (1%)	4/287 (1.4%)	NA‡	4 more per 1,000
Infectious complications (critical outcome) 452 (13 observational studies)	Serious*	No serious inconsistency**	No serious indirectness	Serious†	Undetected	20/182 (11%)	31/270 (11.5%)	NA‡	5 more per 1,000

\*Historical controls only.

\*\*Inconsistency could not be adequately assessed.

†Few events; total sample size not high.

‡No reliable relative comparative effect estimate available because of comparison with historical controls.

replace clinical judgment as individual patient circumstances/conditions may dictate variation to the suggested recommendations. The data regarding mortality related to each PICO question are questionable to the committee because the raw reporting of mortality was overwhelmingly unaccompanied by explanation of the cause of death.

## CONCLUSION

In summary, we propose three conditional evidence-based recommendations regarding the management of nondestructive extraperitoneal penetrating rectal injury in the non-combat-injured patient, which were formulated using the GRADE methodology. We conditionally recommend proximal diversion for management of these injuries. The committee conditionally recommends the avoidance of both routine presacral drains and distal rectal washout in the management of these injuries.

## AUTHORSHIP

P.L.B., J.J.C., and E.R.H. conceived of this study. P.L.B., J.J.C., H.A.D., R.P.G., E.R.H., A.A.M., N.J.P., L.A.R., and A.R. developed the PICO questions. P.L.B., J.J.C., H.A.D., N.F., R.P.G., A.A.M., N.J.P., L.A.R., and A.R. examined the literature. P.L.B., J.J.C., H.A.D., N.F., R.P.G., A.A.M., N.J.P., L.A.R., and A.R. performed the data extraction. P.L.B., J.J.C., H.A.D., Y.F.Y., N.F., R.P.G., E.R.H., A.A.M., G.M., N.J.P., L.A.R., and A.R. contributed to the data interpretation. P.L.B., J.J.C., Y.F.Y., N.F., and B.R. wrote the manuscript.

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## DISCLOSURE

The authors declare no conflicts of interest.

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