Is there a role for oral antibiotics following primary surgical debridement of open injuries?

Section 1: Background

Open fractures expose the fracture site to the external environment and carry a substantially higher risk of infection than closed injuries, with reported rates rising from around 0 to 2 per cent in type I injuries to 20 to 25 per cent or more in type III injuries. Early systemic antibiotics, given together with prompt and thorough surgical debridement, remain the foundation of infection prevention.

A question that recurs in everyday practice is what should happen to antibiotic therapy once primary debridement has been carried out, and in particular whether there is any value in continuing with, or stepping down to, oral antibiotics. Recent guidelines have favoured shorter courses, commonly up to 24 hours after injury or after definitive wound closure in severe injuries, and narrower spectra, which would tend to discourage prolonged oral continuation where no infection has been established. Against this, oral agents are sometimes used pragmatically when closure is delayed or when prolonged inpatient intravenous therapy is impractical.

What remains unclear, and is not resolved by the articles available for this review, is whether a defined oral course after debridement alters clinically important outcomes such as surgical-site infection, deep infection, non-union or readmission, when compared with standard short-course systemic prophylaxis. The question matters for antibiotic stewardship, for the burden placed on patients after discharge, and for the wide variation in open-fracture care between settings.

It should be acknowledged at the outset that the seven articles supplied for this question concern antibiotic prophylaxis in open fractures more generally, and that none directly tests oral antibiotics after debridement. The synthesis and recommendation that follow therefore rest largely on indirect evidence, and directly relevant studies will need to be added before the recommendation is finalised.

Section 2: Data extraction table

No.	Author, year, country	Study design (level of evidence)	Sample size	Population (inclusion / exclusion)	Intervention / comparator	Key results and bearing on the question
1	Via et al., 2023, USA	Retrospective cohort (Level III)	138 type III open fractures (42 cefotetan; 96 non-cefotetan)	Adults ≥18 yr with Gustilo-Anderson type III open long-bone fractures (Sep 2010–Dec 2019). Excluded: age <18, death within 30 days, index amputation, gunshot injury.	Intravenous cefotetan monotherapy versus any other (mostly intravenous) regimen, with follow-up to one year.	Surgical-site and deep-infection rates were similar (SSI 16.7% vs 14.7%, P=0.773; deep infection 9.5% vs 11.6%, P=0.719). The cefotetan group received fewer outpatient antibiotic prescriptions over the following year (21.4% vs 41.1%, P=0.023) and returned to theatre less often (35.7% vs 54.2%, P=0.045). Oral antibiotic use is recorded here as an outcome reflecting later complications, not as a planned intervention, so its bearing on the question is indirect.
2	Buckman et al., 2022, USA	Systematic review / guideline (GRADE)	26 included studies across three PICO questions	Adults (>18 yr) with open long-bone extremity fractures; combat injuries excluded.	Systemic antibiotic prophylaxis: spectrum, duration and local therapy.	For type I and II injuries the panel recommended against extended-spectrum cover beyond gram-positive agents (2C). For type III injuries it recommended limiting antibiotics to no more than 24 hours after injury

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						when there is no active infection (1C), and advised against broader cover (2C); local antibiotics were supported for type III injuries with bone loss (2C). Route is treated as systemic throughout, and the duration evidence argues against prolonging therapy, including any oral continuation.
3	Zhong et al., 2023, China	Retrospective multicentre cohort	1348 patients; 1187 cultured	Lower-extremity open fractures across six East-China trauma centres (Jan 2015–Dec 2017).	Intravenous prophylaxis (cefotiam or cefuroxime); pathogen and resistance profiling.	Wound cultures were positive in 54.8% of cases, and most isolates were sensitive to the prophylaxis used; gram-negative and nosocomial organisms were increasingly common. The study provides microbiological and resistance context only, with no oral-antibiotic comparison.
4	Sagi & Patzakis, 2021, USA	Narrative review (Therapeutic Level V)	Multiple summarised studies	Open fractures of all types; acute-management focus.	Debridement timing, irrigation, wound-closure timing, antibiotic beads and negative-pressure dressings.	The recommendations favour early systemic antibiotics and local delivery for severe injuries, and do not address a role for oral antibiotics after debridement.
5	Minehara et al., 2024, Japan	Symposium / narrative review with case series	CLAP case series of 40 patients with infection	Severe open fractures and fracture-related infection.	Fix-and-flap reconstruction, continuous local antibiotic perfusion (CLAP), and the chipping technique.	The continuous local perfusion series reported 87% implant retention with later eradication in recurrences. The work concerns local antibiotic delivery and reconstruction rather than the oral route.
6	Alonge et al., 2002, Nigeria	Prospective study	52 open fractures	Open fractures presenting to the accident and emergency unit, University College Hospital, Ibadan (Jan–Jun 2000).	Wound culture and sensitivity; formulation of an antibiotic policy.	Cultures were positive in over 70% of cases, with S. aureus most common; sensitivities favoured pefloxacin, ciprofloxacin and ceftriaxone, and the authors recommended a five-day parenteral regimen. The quinolones discussed are orally available but were given parenterally, so the study speaks to agent selection rather than the oral route.
7	Makarewich et al., 2022, USA	Retrospective pre/post comparative (Level III)	50 pre-pathway; 29 post-pathway	Children (0–18 yr) with open pelvic or extremity fractures. Excluded: spine, hand, foot, ballistic injuries.	A care pathway intended to shorten time to intravenous antibiotic administration.	Time from emergency-department arrival to administration fell from 163.3 to 99.2 minutes (P=0.004), with intravenous regimens throughout. The study concerns timing and

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						process, not oral antibiotics.

Section 3:

Results summary

Taken together, the seven papers describe antibiotic use for open fractures almost entirely as systemic, and predominantly intravenous, prophylaxis. None was designed to test an oral course following debridement. The only oral-related figure comes from Via and colleagues, who recorded outpatient antibiotic prescriptions during the year after injury as an outcome: patients given intravenous cefotetan monotherapy received fewer such prescriptions than those given other regimens (21.4 versus 41.1 per cent), alongside fewer returns to theatre and comparable infection rates. This describes oral antibiotic use as a marker of how patients fared rather than as a treatment strategy.

The Surgical Infection Society guideline is the most directly applicable on duration and spectrum. For type III injuries it advises against continuing antibiotics beyond 24 hours after injury in the absence of active infection, and against broadening cover past gram-positive organisms; for type III injuries with bone loss it supports adjunctive local antibiotics. The systematic reviews it draws on consistently found no advantage to courses lasting beyond 24 to 72 hours. By extension, this evidence does not favour prolonging treatment by means of an oral course once short systemic prophylaxis and debridement have been completed.

The remaining studies provide context rather than an answer. Zhong and colleagues describe the local microbiology and resistance picture; Sagi and Patzakis, and Minehara and colleagues, emphasise early systemic treatment together with local delivery for severe injuries; Alonge and colleagues recommend a sensitivity-guided parenteral regimen in a resource-limited setting; and Makarewich and colleagues address only how quickly intravenous antibiotics are given. None reports a direct comparison of oral against intravenous, or against no continuation, after debridement.

Section 4: Discussion

The main difficulty in answering this question from the available papers is that none of them was written to answer it. The literature supplied is reasonably firm on several neighbouring points. Early systemic antibiotics reduce infection; narrower spectra and shorter durations appear to be no worse than broader or longer regimens; and local antibiotic delivery is of value in severe type III injuries with bone loss. What is missing is any study comparing the option of continuing or stepping down to oral antibiotics after debridement with the option of stopping. Any recommendation drawn only from these papers is therefore an inference rather than a direct finding, and should be read as such.

Two lines of indirect evidence are nonetheless useful. The first is the duration literature gathered in the 2022 Surgical Infection Society guideline, which repeatedly shows no benefit from extending antibiotics beyond 24 to 72 hours. Because much real-world oral use simply lengthens the total course, this is the most relevant evidence available, and it points away from routine oral continuation when no infection is present. The second is the observation by Via and colleagues that fewer outpatient prescriptions accompanied a regimen with fewer reoperations, which suggests that oral antibiotics prescribed after discharge often reflect developing problems rather than effective prophylaxis. That is a reason to interpret such courses with caution rather than as protective.

Microbiology reinforces the point. Zhong and colleagues document a shifting flora, with a growing proportion of gram-negative and nosocomial organisms and appreciable resistance, while the broader reviews note rising methicillin-resistant S. aureus. An empirical oral step-down risks providing inadequate tissue concentrations, particularly in poorly vascularised severe wounds where penetration is already limited, while still contributing to

selection pressure. Where higher local concentrations are needed, the reviewed evidence supports delivery through beads or perfusion rather than systemic escalation, and offers nothing to suggest that oral agents can fill that role.

There are, however, situations these papers do not adequately cover and that the panel may wish to weigh. Staged or delayed wound closure, resource-limited settings where prolonged inpatient intravenous therapy is impractical, and the use of highly bioavailable oral agents as functional equivalents of intravenous treatment are all met in practice. The last of these carries an important caveat: fluoroquinolones, often the agents proposed for oral use, have been associated with impaired fracture healing and with higher infection rates in type III injuries, so they are not a straightforward substitute. None of these scenarios is supported by direct comparative data in the supplied set.

The principal limitation of this review is thus the mismatch between the question and the evidence. The studies are mostly retrospective cohorts, narrative reviews and a single guideline, and none addresses the oral route as an intervention. Before the recommendation is put to a vote, the panel should retrieve and appraise the studies that do test oral, intravenous-to-oral, or step-down therapy after debridement. A supplementary search has already identified several of these, including paediatric randomised trials and the wider orthopaedic infection literature on oral versus intravenous treatment; they were not part of the original article set and are listed separately for consideration.

Section 5: Risk of bias of included studies

Overall risk of bias for the purpose of answering this question is high, mainly because the evidence is indirect. The designs are predominantly retrospective cohorts, narrative reviews and one guideline, with no randomised trial addressing oral antibiotics after debridement. Several cohorts are single-centre and underpowered for infection outcomes, and the comparator regimens are not standardised. The Surgical Infection Society guideline is the most rigorous item, having applied the GRADE framework, but its recommendations concern systemic spectrum and duration rather than the oral route.

Rating: HIGH (driven by indirect evidence).

Section 6: Response / Recommendation

There is no good evidence that routine oral antibiotics after primary surgical debridement of open injuries improve outcomes. Short-course systemic prophylaxis, given up to 24 hours after injury or after definitive wound closure in severe injuries, remains the standard of care, and prolonging treatment by an oral course is not supported where no infection has been established. Oral step-down may be reasonable in selected circumstances, such as staged closure or settings in which prolonged intravenous therapy is impractical, but this is a pragmatic position rather than one backed by direct comparative evidence.

Section 7: Level / strength of evidence

Strength of evidence: LOW.

The available evidence consists of retrospective cohorts, narrative reviews and one guideline, with no randomised or comparative study of the oral route after debridement. Its bearing on the question is indirect, the samples are small and varied, and the comparator regimens differ between studies. A low rating is therefore appropriate, and it should be reconsidered if the directly relevant studies are added.

References

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The reference list contains only the seven articles supplied for this question. Additional relevant studies, including those found in the supplementary search, are to be added by the team.