Supplemental Appendix S1:

eFigure 1—Modified PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2009 flow diagram illustrating the strategy used to identify reports of diaphyseal long bone fractures in chinchillas via a search (2010 to 2015) of the mammals: small and exotic folder of the Veterinary Information Network.a

**Modified PRISMA 2009 Flow Diagram**

*Diaphyseal long bone fractures in chinchillas. VIN Message Boards: Mammals Small and Exotic Folder (performed April 11, 2016)*

VIN (1996-2016)
Restricted to [Message Boards] AND [Mammals Small and Exotic Folder]

Search terms [“chinchilla” AND “fracture”]
(n = 76)

Records after selective removal of:
dental or tooth fractures (n = 27) OR
fractures in bones other than long bones (n = 19)
(n = 30)

Message board discussions after duplicates removed
Not applicable

Message board discussions excluded:
Fractures of long bones that involve luxations, joints and metaphyses
(n = 11)

Message board discussions assessed for eligibility
(n = 19)

Message board discussions retained
(n = 19)

Figure 2—PRISMA 2009 flow diagram illustrating the strategy used to identify published reports of diaphyseal long bone fractures in chinchillas via a search (2010 to 2015) of CAB, PubMed and BIOSIS.

**PRISMA 2009 Flow Diagram**

**Treatment of metatarsal and metacarpal fractures in small animals (performed April 11, 2016)**

- Records identified through database searching (n = 288)
  - MESH Terms [“metatarsus” AND “fracture fixation”]
    - CAB 1973-2015 (n = 136)
    - PubMed 1920-2016 (n = 138)
    - BIOSIS 1926-2016 (n = 14)

- Records after selective MESH Terms applied [“dogs” OR “cats” OR “rabbits” OR “chinchillas” OR “guinea pigs”]
  - n = 42
    - CAB (n = 32), PubMed (n = 8), BIOSIS (n = 2)

- Records after duplicates removed (n = 32)

- Full-text articles assessed for eligibility (n = 20)

- Records excluded Clearly a review, conference paper, chapter, thesis (n = 12)

- Full-text articles excluded for reason Not a case report, case series, prospective or retrospective study (n = 5)

- Studies retained (n = 15)

- Studies retrieved from references in the retained 15 articles, that were not identified in initial database searches (n = 4)

- Studies included in systematic review (n = 19)
Table 1—Features of the treatment of metacarpal and metatarsal fractures in small animals for studies (n = 19) identified in the published literature.

<table>
<thead>
<tr>
<th>Article</th>
<th>Type of study</th>
<th>Number of animals</th>
<th>Distribution and management technique</th>
<th>Outcome</th>
</tr>
</thead>
</table>
| Manley PA (1981)    | Prospective study | 43 animals, decision for the type of treatment based on medical criteria | - Group 1: medical treatment, variety of techniques. 15 animals  
- Group 2: surgical treatment. 10 animals | - 2 cases lost for follow-up  
- 1 euthanasia  
- 1 case of necrosis: amputation  
- Group 2: 9/10 animals developed complications (lameness, malunion, drainage, and osteomyelitis) (85%)  
- Group 1: 7/15 developed complications (54%) |
| Guilliard MJ (2013) | Prospective study | 18 racing Greyhounds with MT3 fractures | Medical management:  
- 6 dressings  
- 12 cage rest alone | - 2 dogs were retired  
- 2 dogs sustained further injuries  
- 14 dogs successfully returned to racing with no loss form |
| Puerta B de la et al (2008) | Retrospective study | 11 dogs and 11 cats with fractures of all 4 main MT or MC bones | Epoxy Putty External Skeletal fixator | - Median time to frame removal: 8.5 weeks  
- 7/22 minor complications (pin chewing or pin breakage)  
- 22/22 achieved full union and functional recovery |
| Zahn K et al. (2007) | Retrospective, non-randomized. Radiographic review. | 351 cats were initially included | - Group 1: Dowel pinning surgery (192 cats, 54.7%)  
- Group 2: External coaptation (111, 31.6%)  
- Group 3: Combined dowel pinning and external coaptation (48, 13.7%) | 112 cats were reevaluated:  
- Group 1: 63 cats (33%), 2% lameness, 35% synostosis, 2% malunion  
- Group 2: 35 cats (32%), 14% lameness, 20% synostosis, 17% malunion  
- Group 3: 14 cats (29%), 14% lameness, 71% synostosis, 21% malunion |
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Study Type</th>
<th>Number of Animals</th>
<th>Fracture Details</th>
<th>Treatment Details</th>
<th>Outcomes/Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muir P</td>
<td>1997</td>
<td>Retrospective</td>
<td>37</td>
<td>- 26 acute fractures - 11 more chronic fractures (2 weeks to 10 months) - 1 open fracture</td>
<td>- Chronic fractures in 2 dogs: exercise restriction only. Both lost to follow-up - 24 dogs: External coaptation - intra-articular cross pinning in 1 dog - Intramedullary pinning for 2 dogs - Lag screw in one dog - Bone screws + external coaptation in one dog - Bone plate in 6 dogs</td>
<td>- External coaptation: 10 dogs lost to follow-up. Progressive bone healing in 13 dogs, delayed union in 1 dog, improved alignment in 5 dogs - intra-articular cross pinning in 1 dog: non union - Intramedullary pinning for 2 dogs: healing, but malalignment for both - Lag screw in one dog: persistent lameness - Bone screws + external coaptation in one dog: healing - Bone plate in 6 dogs: healing - External coaptation did not consistently improve alignment - 8% non-union in this study</td>
</tr>
<tr>
<td>Lösslein LK</td>
<td>1982</td>
<td>Retrospective</td>
<td>189 (101 MC &amp; 90 MT fractures) &amp; 164 cats (110 MC &amp; 69 MT fractures)</td>
<td></td>
<td>intramedullary pinning + external splinting</td>
<td>intramedullary pinning + external splinting: the most satisfactory technique when closed reduction not possible</td>
</tr>
<tr>
<td>Lorinson D et al. (1996)</td>
<td></td>
<td>Retrospective</td>
<td>72 rabbits, 4 guinea pigs and 3 chinchillas (1 radius/ulna fracture &amp; 2 tibial fractures) with fractures and luxations.</td>
<td></td>
<td>External coaptation for MT fractures</td>
<td>Healed with external coaptation within 4-6 weeks, no complications</td>
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<tr>
<td>Study Authors</td>
<td>Study Design</td>
<td>Study Population</td>
<td>Treatments</td>
<td>Findings</td>
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<td>Kornmayer M et al. (2014)</td>
<td>Retrospective study, non-randomized</td>
<td>100 dogs</td>
<td>Group 1: Medical treatment, 67 dogs&lt;br&gt;Group 2: surgical treatment, 25 dogs&lt;br&gt;Group 3: combined, 8 dogs</td>
<td>Group 1: 16% complications&lt;br&gt;Group 2: 12% complications&lt;br&gt;Group 3: 37% complications&lt;br&gt;Overall lameness by visual clinical assessment: 3%&lt;br&gt;Osteoarthritis: 3%&lt;br&gt;Non-union: 1%&lt;br&gt;Synostosis: 19%, significantly more frequent in group 2&lt;br&gt;Higher complication risk for MT (vs MC) and higher complication risk if higher degree of displacement/instability&lt;br&gt;No significant difference between surgical and medical management</td>
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<td>Kapatkin A et al. (2000)</td>
<td>Retrospective study, non-randomized</td>
<td>25 dogs</td>
<td>- 16 splints&lt;br&gt;- 1 ESF&lt;br&gt;- 5 IM pins&lt;br&gt;- 1 screws&lt;br&gt;- one 2 mm DCP&lt;br&gt;- 1 wires</td>
<td>- owners/clinicians rated result as perfect in 56% of cases for medical treatment, 77% for surgical management&lt;br&gt;- Recovery time longer in surgically treated group (median of 12 weeks, vs 7 weeks for medical)</td>
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<tr>
<td>Bellenger CR et al. (1981)</td>
<td>Retrospective study, non-randomized</td>
<td>23 Greyhounds and 10 other dogs</td>
<td>- 1 euthanasia&lt;br&gt;- 8 dogs with single fracture: external coaptation for 14-21 days&lt;br&gt;- Internal fixation in 14 dogs&lt;br&gt;- Screw alone in 8 dogs (lag)</td>
<td>- All 3 dogs receiving screws and plates healed, 2/3 with callus&lt;br&gt;- 11 dogs treated with internal fixation and/or screws were radiographically rechecked and healed</td>
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<tr>
<td>Study</td>
<td>Study Type</td>
<td>Cases</td>
<td>Treatment</td>
<td>Complications</td>
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<tr>
<td>Fitzpatrick N et al. (2011)</td>
<td>Retrospective study</td>
<td>12 small breed dogs and 19 cats</td>
<td>Combined intramedullary/external fixation</td>
<td>- Fixator removed &lt;10 weeks in all cases and fracture union in all cases by the time of removal - 2 synostosis - 7 pin tract discharge - 8 excessive post-operative swelling - 2 skin abrasion from the frame - 2 paw distorsion (frame impingement)</td>
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<tr>
<td>Degasperi B et al. (2007)</td>
<td>Retrospective study</td>
<td>17 cats</td>
<td>Intramedullary pinning using distraction technique</td>
<td>- 94% owners did not observe any change of gait after treatment (16/17) - One owner reported an excellent function but slight change of gait</td>
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<tr>
<td>Ness MG (1993)</td>
<td>Case series</td>
<td>5 Greyhounds with 6 single stress fractures of MT3 (one dog had 2 fractures at 2 different times)</td>
<td>Bone plate on the dorsal surface of the affected bone</td>
<td>- Dog with 2 fractures recovered after the first one and raced again. Was euthanized after 2&lt;sup&gt;nd&lt;/sup&gt; fracture - All 4 other dogs returned to racing</td>
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<td>Seibert RL et al. (2011)</td>
<td>Case series</td>
<td>3 dogs with multiple MC or MT fractures</td>
<td>One closed fracture and 2 open. Circular external skeletal fixation.</td>
<td>Drainage tracts from the fixator wire in all 3 dogs. Minimal lameness/pain in 2 dogs, transient lameness in the 3&lt;sup&gt;rd&lt;/sup&gt; dog. Removal of the frame in a</td>
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<tr>
<td>Study</td>
<td>Type</td>
<td>Number</td>
<td>Fractures/Details</td>
<td>Treatment</td>
<td>Outcome</td>
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<td>Risselada M et al (2007)</td>
<td>Case series</td>
<td>11 dogs.</td>
<td>5 open fractures (45%) - 9/11 with 4 bones fractured (80%)</td>
<td>External skeletal fixation frame with a walking bar and traction applied to the digits</td>
<td>- Mean recovery time 6.3 weeks - Removal of device after 45 days - 8/11 had a subjectively good functional outcome - 3/11 patients still presented lameness - 9/11 patients had full union on final radiographs.</td>
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<tr>
<td>Candas (1990)</td>
<td>Case series</td>
<td>5 dogs</td>
<td>Intramedullary pinning of 4 MT/MC fractures in 2 dogs, 1 MT/MC fracture in 3 dogs + splint for 3 weeks + pin removal 35-50 days post-op</td>
<td></td>
<td>Successful outcome</td>
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<tr>
<td>Benedetti LT et al. (1986)</td>
<td>Single case report</td>
<td>one 13-year-old cat</td>
<td>Intramedullary pinning of all 4 MT fractures + splint for 6 weeks</td>
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<td>Callus observed on radiographs after 6 weeks</td>
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<tr>
<td>Okamura M et al. (2000)</td>
<td>Single case report</td>
<td>one dog</td>
<td>Intramedullary pinning + epoxy putty resin + fiberglass cast</td>
<td></td>
<td>Successful outcome</td>
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</tbody>
</table>

This supplementary material has been provided by the authors to give readers additional information about their work. This material was peer reviewed.