
Fracture Care by Family Physicians

A Review of 295 Cases

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Background. Although many family physicians treat fractures, few studies have examined the fracture care they provide. Specifically lacking is information on clinical outcome and referral patterns.

Methods. A retrospective chart review of all fractures diagnosed in a rural family practice residency program during a 31-month period was performed.

Results. Of the 295 patients included in the study, 177 (60%) were managed entirely by family physicians, including 34% of patients with fractures that required reduction. An additional 20 patients (7%) were managed with consultation. Information on outcome was available for 170 (86%) of the patients managed by family physicians with and without consultation. Among patients for whom outcome information was available,

79% had full, good, or excellent range of motion, and 61% were completely asymptomatic. Only four patients had significantly decreased range of motion (ROM), and only 10 had significant symptoms. Most patients with significantly decreased ROM or significant symptoms had fractures that required reduction or fractures of the scaphoid.

Conclusions. In the study setting, family physicians managed a wide range of fractures and achieved good clinical results. These data suggest that family physicians can avoid most poor outcomes by carefully selecting which fractures they manage.

Key words. Fractures; physicians, family; outcome, treatment; referral and consultation; orthopedics.
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Orthopedics comprises 8% to 10% of the care provided by family physicians, 6% to 14% of which are fractures.¹ However, little has been written about the management of fractures by family physicians. Several articles addressing practical therapeutics have been published,²⁻⁴ including two that describe guidelines for management and referral of common fractures.^{5,6} Two studies have examined the care provided at family practice fracture and trauma clinics.^{7,8} Both studies found that family physicians managed a wide range of fractures, but neither assessed referral rates, measured patient outcomes, or examined the management of complicated fractures.

This study was designed specifically to examine these

three areas. The setting of this study affords an unusual opportunity to study referral patterns, since most patients who sustain an injury in the community go to a single health care center and are evaluated exclusively by family physicians. The relatively stable rural population also makes it easy to obtain longer follow-up.

Methods

The Blackstone Family Practice Center (BFPC) is the primary teaching site for a rural residency program. It is located 35 miles from the nearest hospital and is the principal source of medical care for this rural area. As a result, many fractures are diagnosed and treated by the four attending family physicians and 12 residents.

Using a practice-based computer into which all patients' diagnoses are entered, all patients diagnosed with a fracture during the period between August 1, 1985,

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and February 28, 1988, were identified. Because a major objective of the study was to study the referral rate, any fractures diagnosed elsewhere and referred to BFPC were excluded from the study.

Each patient's chart was reviewed and the following information abstracted: demographic characteristics, fracture characteristics, and information regarding referral, consultation, and outcome. In 19 cases, patient radiographs were reviewed to confirm information contained in the chart whenever there was reason to doubt the diagnosis of a fracture.

Many charts contained inadequate documentation to determine range of motion (ROM) and symptoms after treatment. Attempts to contact all patients whose charts lacked such documentation were made either by letter or phone. The patients were asked to report recent symptoms or other problems they may have experienced related to the fracture. They were also asked to compare the ROM of the fractured extremity to either the ROM of the unaffected extremity or to the ROM prior to the fracture.

The quality of the reductions performed by family physicians was assessed by a faculty member from the department of orthopedics at the Medical College of Virginia. The assessment was subjective and took into consideration the final radiographic outcome after healing and the characteristics of the fracture and patient.

Results

During the study period, 332 acute fractures were diagnosed. Thirty-seven of these patients were excluded from the study for the following reasons: the fracture was initially diagnosed elsewhere and the patient was referred to BFPC for follow-up care (17 cases); a fracture was diagnosed without radiographs being taken, or with equivocal radiograph results (10 rib, 2 coccyx, 2 facial, 1 toe, and 1 patella fracture), or the injury was considered unlikely to be a fracture after review of the chart and available films for this study (4 cases). The remaining 295 patients were included in the study.

Patient Characteristics

Patients included in the study ranged from 9 months to 100 years old, with an average age of 43.6 years. Thirty one patients (10%) were less than 11 years old and 97 (33%) were over 60 years old. Sixty-eight percent of the patients were white, 31% black, and 1% other. Fifty-three percent of the patients were male.

Fracture Characteristics

The study included patients with fractures of virtually all anatomical regions except the cervical spine. The last column of Table 1 shows the distribution of these fractures in the study. Thirty-five patients sustained more than one fracture as the result of a single injury. To avoid confusion, these fractures were counted only once in the tables. Therefore, if a patient fractured two fingers in a single incident, for instance, that patient was recorded as one patient with a fracture involving the finger. Five patients who sustained fractures of more than one site from one injury, such as metatarsal and toe, were counted only once in the "other" category. Approximately one third of the fractures had features that made their management more complicated. These fractures are listed in Table 2.

Referral Patterns

Ninety-eight patients (33%) were referred for further management of their fracture. Ninety-three of these patients (95% of referrals) were referred at the time of initial visit. The other 5 cases were referred at the time of their second or third visit because of inadequate alignment (3 cases), patient request (1 case), and severe pain following a vertebral compression fracture (1 case).

Eighty-five patients (87% of referrals) were referred to orthopedists, seven (7%) were referred to emergency departments or otolaryngologists for facial fractures, and four (4%) were referred to their own primary care physicians. Two (2%) were admitted for medical reasons and their care was assumed by a specialist. The referral pattern for fractures of each anatomical site is shown in Table 1.

In most cases, it was impossible to determine the actual reason for referral by reviewing the chart. However, nearly two thirds of the referred fractures were complicated by one of the factors listed in Table 2. These factors make management of fractures more difficult and almost certainly contributed to the decision to refer.

Consultation Pattern

In 20 cases, the family physician who managed the fracture consulted a specialist during the care of the patient (Table 1). Orthopedists were consulted in 19 cases and an otolaryngologist was consulted in 1 case. In an additional 2 cases, the radiographs were reviewed with a radiologist to confirm the suspected diagnosis.

In 12 cases, consultation was obtained, generally by telephone, at the time of diagnosis or within the next several days. In 4 cases, consultation was obtained mid-

Table 1. Referral Pattern by Anatomical Site of Fracture

Anatomical Site of Fracture	Patients Managed by Family Physicians Only n (%)	Patients Managed by Family Physicians with Consultation n (%)	Patients Referred n (%)	All Patients N (%)
Face	0	1	8	9 (3)
Spine (all compression)	7	1	2	10 (3)
Rib	14	0	1	15 (5)
Clavicle	11	1	3	15 (5)
Humerus	5	1	6	12 (4)
Radius	21	0	7	28 (9)
Ulna	3	0	3	6 (2)
Radius and ulna	9	2	4	15 (5)
Metacarpal	13	3	2	18 (6)
Carpal	1	1	0	2 (1)
Fingers	29	5	15	49 (17)
Hip	0	0	18	18 (6)
Femur (other than hip)	1	0	2	3 (1)
Fibula	17	1	2	20 (7)
Tibia	3	1	6	10 (3)
Tibia and fibula	0	0	6	6 (2)
Metatarsal	11	2	1	14 (5)
Tarsal	1	0	2	3 (1)
Toe	18	1	4	23 (8)
Other	13	0	6	19 (6)
Total events	177 (60)	20 (7)	98 (33)	295 (99)

Table 2. Management of Complicated Fractures

	Patients Managed by Family Physicians Only	Patients Managed by Family Physicians with Consultation	Patients Referred	Total N (% of all fractures)
Displaced fractures requiring reduction*	12	0	24†	35 (12)
Multiple bones fractured	27	0	8	35 (12)
Intra-articular	3	1	8	12 (4)
Fracture dislocation	0	0	11	11 (4)
Open fracture	2‡	0	9	11 (4)
Epiphyseal plate fractures	2	3	5	10 (3)
Associated tendon injury	1	2	3	6 (2)
Possible nerve injury	0	1	1	2 (1)

*Excludes fracture dislocations and hip fractures.

†In two cases, reduction was attempted unsuccessfully by family physician prior to referral.

‡Both involved the distal phalanx of the finger. An additional 6 patients managed by family practitioners had lacerations overlying the fracture site that did not extend to periosteum.

Table 3. Outcome in Patients Managed by Family Physicians*

Location of Fracture	Range of Motion, n			Symptoms, n		
	Full/Good	Acceptable	Decreased	None	Minimal	Significant
Spine (all compression)	2			5	1	
Rib	N/A			8	4	
Clavicle	10			11	1	
Humerus	5	1		5	1	1
Radius	16	4		12	5	2
Ulna	3	1		3	1	
Radius and ulna	8		2	5	4	1
Carpal		1	1			2
Metacarpal	10	3		8	2	3
Fingers	19	8	1	18	11	
Fibula	16	1		8	8	1
Tibia	2			1	1	
Tarsal	1			1		
Metatarsal	5	1		4	5	
Toe	9	2		11	5	
Other	1	1		2	5	
Total events (%)	105 (80)	23 (17)	4 (3)	102 (61)	54 (33)	10 (6)

*Includes patients managed with consultations.

way through the care of the patient, and in 4 cases it was obtained late in the care of the patient. Reasons for late consultations included extensor tendon injury, which was not recognized at initial presentation (2 cases); unsatisfactory strength posttreatment (1 case); and carpal tunnel syndrome, which developed 4 months after treatment for a fifth metacarpal fracture (1 case).

Outcome in Patients Managed by Family Physicians

Information on outcome (ROM or symptoms or both) was available for 170 (86%) of the 198 patients managed by family physicians. These patients are demographically similar to all patients managed by family physicians in this study (age, 39.0 vs 42.0; male, 54.8% vs 51.9%; black, 31.5% vs 30.5%).

Outcome was determined from the patient's chart in 78 cases, from a combination of chart and phone or letter follow-up in 66 cases, and from phone or letter follow-up alone in 26 cases (patients whose charts contained no outcome information). Attempts made to contact 136 patients by phone or letter were successful in 95 cases (70%). In 76 cases, the patient was reached and the requested information provided. In 12 cases, information regarding children was obtained from a parent or other

immediate family member. Information was obtained from the caretakers of two demented adults and from family members of six adults who could not be reached directly. In one case, information obtained on letter follow-up was discarded because it conflicted with information in the chart. The average length of follow-up was 2.3 years for patients with phone or letter follow-up, and 7 weeks for patients without phone follow-up.

Data on range of motion were available on 132 patients. This represents 73% of all patients managed by family physicians for whom ROM applies (ROM was considered nonapplicable for rib and facial fractures). ROM data are summarized in Table 3. In 105 cases (80%), ROM was good, full, or excellent. In most cases, this classification was based directly on wording used in the chart by the treating physician, but in some cases, it was based on quantitative ROM measurement recorded in the chart or on a patient's subjective report at the time of phone or letter follow-up.

In 23 cases (17%), range of motion was considered acceptable for the fracture involved. In seven of these cases, outcome was assessed less than 8 weeks after the fracture when full ROM would not be expected. Typical examples of ROM considered acceptable include: "lacks 5 degrees flexion," "full ROM except tightness with inversion," and "lacks extreme dorsiflexion." The worst

ROMs considered acceptable occurred in a patient who lacked 7 degrees of dorsiflexion of the ankle 18 weeks after a distal fibula fracture, and in a demented patient who could flex his finger only 5 to 10 degrees when seen 2 weeks after a fracture (further follow-up of this patient was unavailable).

Four patients had a significant reduction in ROM. Two were asymptomatic and had fully resumed their previous activities (one had a mallet finger following an avulsed extensor tendon and the other lacked 20 degrees of flexion following an intra-articular Colles' fracture that required reduction). The other patients had persistent pain and were bothered by loss of ROM following a scaphoid fracture and a Colles' fracture that required reduction.

Data on symptoms were available for 166 patients (84% of all patients managed by family physicians). These data are summarized in Table 3. One hundred two patients (61%) were asymptomatic at follow-up. All remaining patients had types and degrees of symptoms commonly seen following the fractures they sustained. These symptoms were classified as "minimal" or "significant" based on pain, strength, and restriction of activity. Symptoms were classified as minimal in 54 patients (33%). In 26 of these cases, outcome was assessed less than 8 weeks after the fracture when some mild symptoms would still be expected. Typical examples of minimal symptoms included: "occasional minimal ache" and "full activity, aches occasionally if bad weather." The worst symptoms to be considered "minimal" were "50% strength; able to do all of her usual activities" 11 weeks after a distal radius fracture in an elderly patient, and "70% strength, shoulder and wrist pain in damp weather" 17 weeks after a Colles' fracture that required reduction.

Significant symptoms were noted in 10 cases (6%). Examples of significant symptoms include: "aches, 50% strength" 1 year after a fifth metacarpal fracture and "swelling and hurting, grip not as good as it was" 13 weeks after a distal radius fracture that required reduction. The worst symptoms occurred in a patient who reported "hurts all the time, no strength to open jar" 130 weeks after a fracture of the scaphoid.

Management of Complicated Fractures

Fractures Requiring Reduction

Thirty-five patients had fractures with significant displacement or angulation (excluding fracture dislocations and hip fractures). These included 16 fractures of the

forearm, 7 of the face (primarily nasal), 5 of the humerus, 5 of the finger, and 5 of other sites.

Family physicians successfully reduced 12 (34%) of these fractures without orthopedic consultation or referral. These included 8 fractures of the radius and/or ulna, 2 spiral fractures of the humerus, 1 fifth metacarpal (Boxer's) fracture, and 1 toe fracture. Reduction was attempted unsuccessfully in three other patients. In two cases, improvement in position was not adequate, and the patient was referred. In the other case, position was not improved after attempted reduction, but no further attempts were made because the position was acceptable (a Colles' fracture with 10 degrees of dorsal angulation).

The adequacy of reduction could be determined for 9 of the 12 patients reduced by family physicians (films not available for the toe and metacarpal fractures and one distal radius fracture). The orthopedist who reviewed the films used a scale of A to F (analogous to grades) to rate the reductions. One reduction was rated "A+" (spiral humerus fracture), 5 were rated "A" (3 Colles' fractures, 1 distal radius, and 1 midshaft radius and ulna in a child), 2 were rated "B" (Colles' fracture and spiral humerus) and 1 was rated "D" (intra-articular Colles' that settled unacceptably after initial acceptable reduction). On follow-up, this patient lacked 20 degrees of flexion and had a "poor cosmetic knot" but was "able to do anything" and had no discomfort. The orthopedist agreed that the position was acceptable in the patient with the distal radius fracture whose position did not improve following attempted reduction.

Patients with fractures requiring reduction had worse outcomes than the other patients managed by family physicians. ROM was full, good, or excellent in 44%, acceptable in 33%, and significantly reduced in 22%. Forty percent were asymptomatic, 30% had minimal symptoms, and 30% had significant symptoms.

Epiphyseal Plate Fractures

Ten fractures involving the epiphyseal plate were diagnosed during the study period. Of these, five involved the finger or toe and two involved the forearm. All types of Salter-Harris fractures except type V occurred.

Family physicians managed two epiphyseal fractures involving the finger (both type II), two involving the toe (types III and IV), and one involving the distal radius (type I). All three displaced epiphyseal fractures were referred.

Patients with epiphyseal plate fractures tended to do quite well. All five had full ROM and no symptoms, which is consistent with what could be expected given the location and Salter-Harris classification of these fractures.

Table 4. Complications Noted in Patients Managed by Family Physicians

Complication	No.
Superficial skin infection (fibula, toe, and humerus fractures)	3
Unrecognized injury of extensor tendon (finger fractures)	2
Deep venous thrombosis (fibula fracture)	1
Local paraesthesia (orbital fracture)	1
Skin abrasion during cast removal (radius fracture)	1
Chronic pain 2° to local nerve injury	1
Intra-articular fracture fragment (ulna fracture)†	1
Carpal tunnel syndrome (proximal 5th metacarpal fracture)	1
Reflex sympathetic dystrophy (Colles' fracture)	1
Total	12

†Fracture missed on initial presentation. Patient presented 18 months later, underwent excision, and at follow-up had nearly full ROM and no symptoms.

Intra-articular Fractures

Family physicians managed four (33%) of the intra-articular fractures. All four fractures were nondisplaced and involved the finger, proximal fifth metacarpal, distal radius, and proximal ulna. One of these patients (proximal ulna fracture) refused referral and, therefore, was managed by the family physician.

Patients with intra-articular fractures had worse ROM than did other patients managed by family physicians (one full, two acceptable, and one significantly reduced) but had average symptoms (two asymptomatic and two with minimal symptoms).

Complications Encountered During Fracture Management

Complications occurring in patients managed by family physicians are listed in Table 4. These complications resolved fully during treatment with the exception of two cases. One of the patients with an unrecognized extensor tendon avulsion had persistent 45-degree downward angulation of the distal interphalangeal joint, but was completely asymptomatic and had resumed all prior activities. A patient with a fibula fracture developed chronic pain near the fracture site. After evaluation by an orthopedist and neurologist, the pain was attributed to local nerve injury and has since responded well to daily nortriptyline.

Discussion

These data support other studies which have found that family physicians can manage a wide range of fractures.^{7,8} In our setting, family physicians managed fractures of many different anatomical sites and treated patients ranging from infants to the elderly. This study extends the information regarding fracture management by family physicians by demonstrating that under appropriate cir-

cumstances, they can manage up to two thirds of all fractures with good clinical results. This study also demonstrates that given proper training and supervision, family physicians can manage some complicated fractures. The physicians in this study performed nearly one third of the reductions, as well as managing selected intra-articular and epiphyseal plate fractures.

The outcomes achieved by family physicians in this setting appear very good. Only four patients had a significant decrease in range of motion, and two of these patients fully resumed their previous activities. Only 10 patients had significant symptoms at the end of follow-up. As might be expected, fractures requiring reduction and those involving an articular surface or the scaphoid bone had the worst outcomes. Indeed, scaphoid fractures and fractures that required reduction accounted for the majority of patients with decreased ROM (3 of 4) and significant symptoms (5 of 10).

Complications that occurred during care are another potential indicator of the quality of care. With one possible exception, complications noted in patients managed by family physicians were minor and not unusual for the type of fracture involved. One possible exception involved an ulna fracture not recognized on initial presentation, which proceeded to develop nonunion and an intra-articular fracture fragment. Although the patient essentially regained full function of the involved elbow following surgery, this complication and the resultant surgery may have been avoidable. Although the fracture was very subtle, an abnormal posterior fat pad sign was clearly visible on the patient's initial radiographs. Had the physician who initially evaluated the patient noticed the posterior fat pad, this fracture probably would not have been missed.

There are three main limitations to the data reported in this study. The information on range of motion was not as precise or accurate as the investigators had hoped, and in most cases, it was based on qualitative assessments by the treating physician. Information on ROM obtained from phone interviews or correspondence with patients is probably more precise, in that each patient was asked to compare ROM at the affected site with that of the opposite extremity or with ROM in the fractured area prior to the injury. Nonetheless, these data were based entirely on subjective response that was not corroborated by direct observation. Despite limitations, the ROM data still provide useful information including indications that the vast majority of patients were satisfied with the ROM they obtained.

Another limitation of the study is that information on outcome could not be obtained for all patients. However, there is reason to believe that the outcome in patients lost to follow-up is likely to be at least as good as

the data shown in Table 3. Most patients lost to follow-up had benign fractures: 50% involved the finger, toe, or rib, and none required reduction.

No attempt was made to compare the outcomes of patients in this study with results reported in the orthopedic literature. Because the number of each type of fracture reported in this study is quite small, a comparison probably would not produce statistically significant findings.

Although this study is based on the experience of one setting, there is reason to believe that the findings of this study are more widely applicable. When compared with four other data sources,¹ the fractures included in this study seem to be representative of fractures diagnosed by other samples of family physicians. The observed referral pattern closely matches the guidelines published by Medley and associates² and Swenson.³ Several patients managed by family physicians in the current study had fractures that Medley and Swenson believed could be managed by family physicians with greater orthopedic experience and training than that of most family physicians. Therefore, physicians with less experience might be expected to have a higher referral rate than that observed in this study.

Three factors made it possible for the family physicians in this study to manage a wide range of fractures. First, they had access to a relatively large number of patients with fractures. Second, two of the four attending physicians had considerable experience managing fractures. Each had practiced rural family medicine for more than 30 years, during which they had managed more than 30 fractures per year (more than 1000 fractures each). These attending physicians frequently managed more complicated fractures, such as intra-articular fractures and those requiring reduction, and provided invaluable assistance in the management of many patients. Finally, there was a close working relationship between orthopedists and family physicians. Orthopedists were available for phone consultation at any time and gave regular conferences for the residents. Complicated or difficult cases were often presented after these conferences.

Conclusions

In the setting studied, family physicians were able to manage a wide range of fractures and obtain good clinical outcomes. Because they had extra orthopedic experience and training, as well as supportive orthopedic backup they were able to manage some more complicated fractures, including one third of the fractures requiring reduction, most patients with multiple fractures, and selected nondisplaced intra-articular and epiphyseal plate fractures. The worst outcomes occurred in patients who had fractures that required reduction, intra-articular fractures, and fractures of the scaphoid. Nearly all other fractures treated by family physicians did very well, suggesting that most adverse outcomes can be avoided if family physicians carefully select which fractures they manage and use available supportive backup when appropriate.

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