

# Identifying factors influencing use of lumbar x-rays: *A predictive study*

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**McGill**

# Background

- Routine imaging for uncomplicated back pain is not associated with clinically meaningful benefits but can lead to harms (Chou 2009, 2011)
- Thus, in the absence of red flags, national guidelines recommend against using lumbar x-rays (Nice 2009, Koes 2010)
- In spite of this, evidence of overuse & misuse of imaging services persists  
(Chou 2009, Ivanova 2011, Houben 2006, Ammendolia 2007, Bussièrès 2013 )

# Background (2)

- "Spending on diagnostic imaging in Canada has increased significantly and now exceeds an estimated \$2.2 billion annually"
  - 10-20% may be unnecessary tests (Canadian Association of Radiologists)
  - Eliminating unnecessary tests could save \$220 million each year
- "Participating Canadian provinces and territories agreed to adopt guidelines for the use of medical imaging in minor head injuries, lower back pain and headaches"

*Statement on health priorities flagged unnecessary imaging related to LBP as a priority area  
Canadian Premiers' meeting (July 2013)*

# Background (3)



- Despite substantial human and financial investments, CPGs continue to be underutilized
- Passive dissemination strategies tend to result in a small to modest improvements in the process of care among physicians and chiropractors  
(Giguère 2012, Farmer 2008, French 2010, Rx for Change 2012, Bussières 2013)
- Few studies evaluating the effectiveness of guideline D & I strategies have explicitly used theory (Davies 2010)



# Rationale

- Effectiveness of guideline implementation strategies appears to vary across different clinical problems, contexts, health care professions, and organizations

(Grol 2003, Wensing 2005)

- Explicit use of theories offers a way of addressing these issues. Successfully used:
  - to explore determinants of behaviour change
  - to help design targeted interventions to change practice

[Bonneti 2005, 2010, Eccles 2007, Grimshaw 2011, French 2012, McKenzie 2008]



# Objective

- Few studies have explored the usefulness of theoretical constructs among chiropractors
- ❖ To investigate the use of psychological theories to predict factors associated with chiropractic management of back pain patients without x-rays

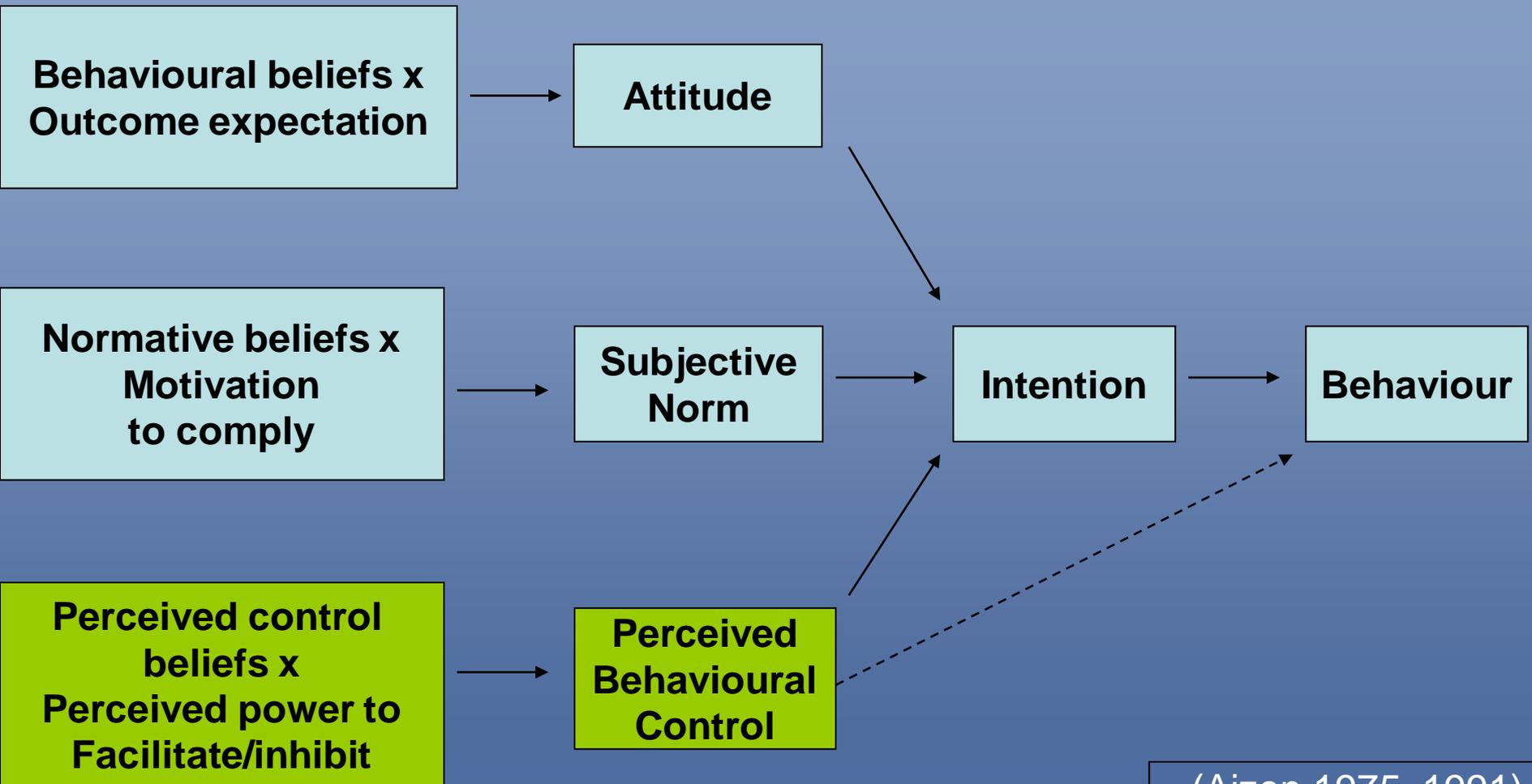


# Methods

**Design:** theory-based single postal questionnaire

- Random sample: 750 Ontario (Canada) and 1000 Practice Network (USA) chiropractors
- Proxy outcomes: behavioural simulation and intention
- **Explanatory variables**
  - Motivational theories (TPB, TIB), action theories (OLT, action/coping planning), and two constructs: personal moral norm (PMN) and Self-Reported Habit Index (SRHI)
- **Professional and practice-related factors**
  - Age, gender, years in practice, onsite imaging, employment, number of providers, location, practice setting

# Theory of Planned Behaviour (TPB)



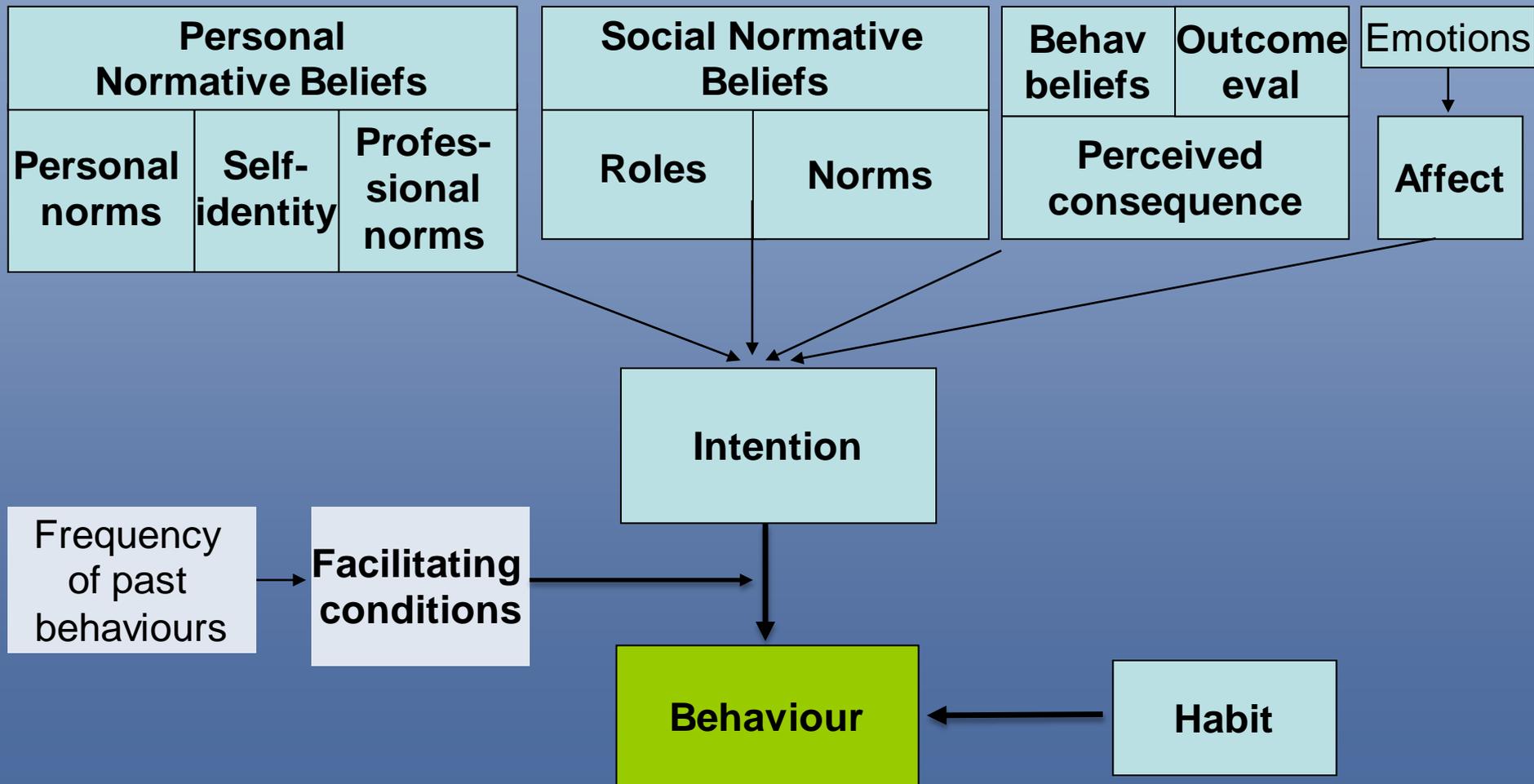
(Ajzen 1975, 1991)

# Examples of predictive measures to investigating beliefs associated with the behaviour of interest

- Attitude
  - **D**: 'Managing patients... would be (not at all beneficial/very beneficial)'
  - **I**: Managing patients... would increase the risk of missing an underlying pathology (bb: very unlikely/very likely) **X** Missing an underlying pathology (oe: un/important)
- Seven-point scale: 'Strongly Disagree' to 'Strongly Agree'

# Triandis' Theory of Interpersonal Behaviour (TIB)

(Gagnon et al. 2006 with permission)



# Analysis/Results

- ❖ Correlation and multiple regression analysis to examine predictive value of each theoretical model individually.
- 31% response rate
- About 50% would have ordered lumbar x-rays across the 5 case scenarios even if not needed.
- Years in practice and onsite imaging explained 8-15% of the variance.
- Theory level variance was respectively:

# Ontario (Canada)

## Behavioural simulation

## Behavioural intention

Theory	Predictive Constructs	Beta	R <sup>2</sup> (adj)	F	Beta	R <sup>2</sup> (adj)	F
<i>Theory of Planned Behavior</i> <sup>1</sup>	Intention <sup>a</sup>	0.66***					
	PBC direct	0.01					
	PBC indirect	0.19***	0.59	98.9***			
	Attitude direct				0.26***		
	Attitude indirect				0.05		
	Subjective Norms direct				0.48**		
	Subjective Norm indirect				0.03		
	PBC direct				0.22***		
	PBC indirect				0.03	0.85	151.5***
<i>Theory of Interpersonal Behavior</i>	Intention <sup>b</sup>	-0.62***					
	Facilitating Factors	-0.36					
	Habit	0.16*	0.57	89.3***			
	Affect				0.23***		
	Perceived consequences				0.12**		
	Social Norms				0.29***		
	Personal Normative Beliefs <sup>c</sup>				0.07*		
Moral Norms				0.36***	0.83	198.3***	
<i>Personal Moral Norm</i>	Personal Moral Norms <sup>d</sup>	0.70***	0.49	208.4***			
<i>Operant Learning Theory</i>	Self-Reported Past Behaviour	0.22***			0.17**		
	Evidence of habit	0.39***			0.49***		
	Anticipated Consequences	0.19**	0.49	68.4***	0.24***	0.62	118.2***
<i>Planning</i>	Action Planning	0.49***					
	Coping Planning	0.09	0.28	42.1***			
<i>Habit</i>	Self-Report Habit Index	0.65***	0.42	152.5***	0.77***	0.59	310.3***

\*p ≤ 0.05; \*\*p ≤ 0.01; \*\*\*p ≤ 0.001

## Practice Network (US)

## Behavioural simulation

## Behavioural intention

Theory	Predictive Constructs	Beta	R <sup>2</sup> (adj)	F	Beta	R <sup>2</sup> (adj)	F
<i>Theory of Planned Behavior</i> <sup>1</sup>	Intention <sup>a</sup>	0.58***					
	PBC direct	0.13					
	PBC indirect	0.78	0.52	65.2***			
	Attitude direct				0.20***		
	Attitude indirect				0.15**		
	Subjective Norms direct				0.32***		
	Subjective Norm indirect				0.08		
	PBC direct				0.31***		
	PBC indirect				0.04	0.74	82.8***
<i>Theory of Interpersonal Behavior</i>	Intention <sup>b</sup>	-0.40***					
	Facilitating Factors	-0.18***					
	Habit	0.35***	0.54	69.9***			
	Affect				0.19***		
	Perceived consequences				0.02		
	Social Norms				0.07		
	Personal Normative Beliefs <sup>c</sup>				0.15**		
	Moral Norms				0.58****	0.81	145.1***
<i>Personal Moral Norm</i>	Personal Moral Norms <sup>d</sup>	0.68***	0.46	159.7***			
<i>Operant Learning Theory</i>	Self-Reported Past Behaviour	0.24***			0.27***		
	Evidence of habit	0.42***			0.40***		
	Anticipated Consequences	0.19*	0.52	65.3***	0.29***	0.69	133.2***
<i>Planning</i>	Action Planning	0.55***					
	Coping Planning	-0.12	0.29	38.6***			
<i>Habit</i>	Self-Report Habit Index	0.69***	0.48	162.8***	0.72***	0.52	197.2***

\*p ≤ 0.05; \*\*p ≤ 0.01; \*\*\*p ≤ 0.001

# Discussion

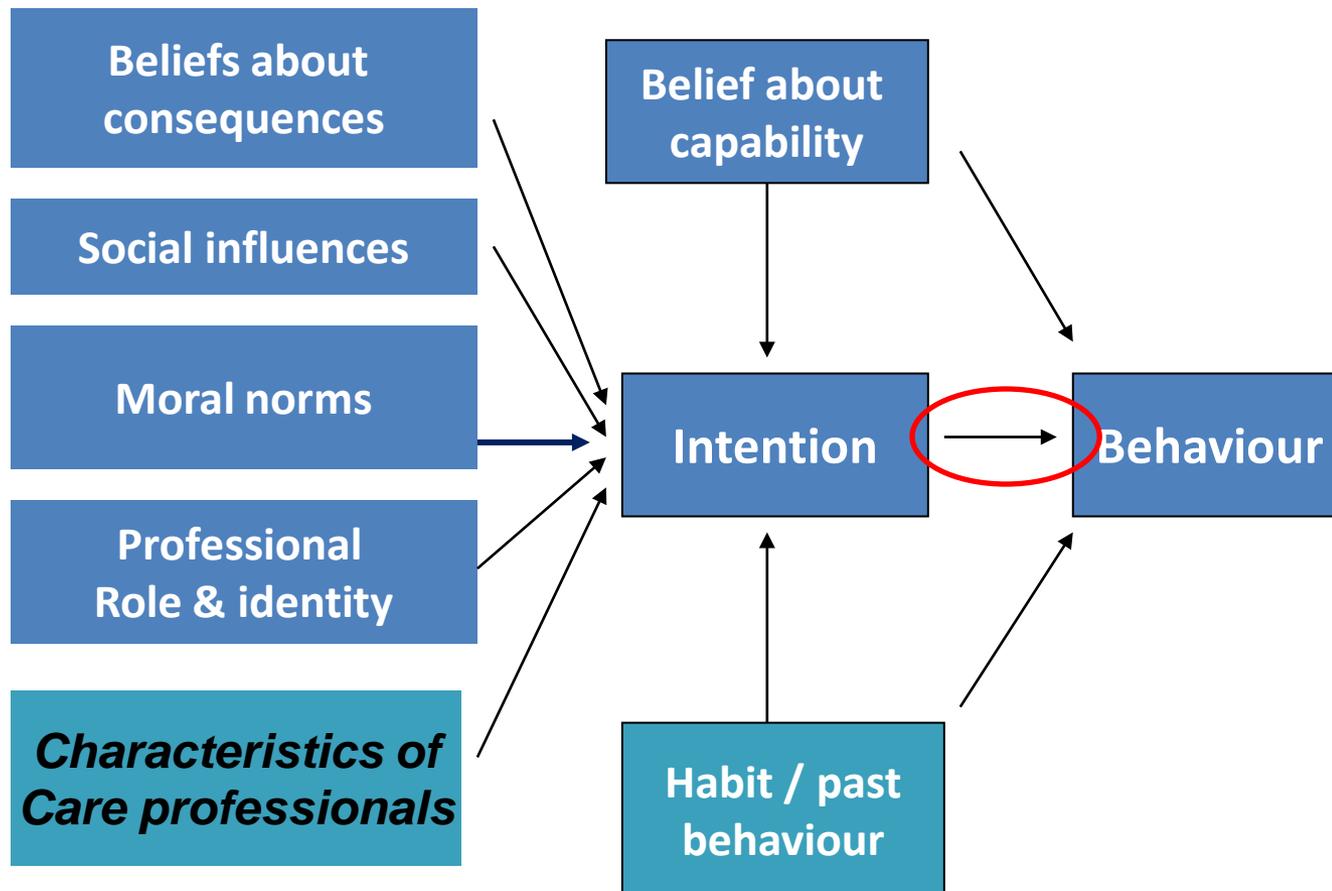
- Theoretical constructs explained a very large portion of the variance in both behavioural simulation (up to 59%) and intention (85%).
- While chiropractors had strong intentions to manage back pain patient without x-rays, this did not necessarily translate into low x-ray use.

# Discussion

- Interventions to increase intentions are unlikely to be successful.
- Strategies to bridge the intention-behaviour gap may have greater likelihood of success.
- Self-efficacy beliefs and planning may be better suited to execute intended changes in behavior and subsequently maintain these changes

[Godin 2008, Gollwitzer 2006, Reuter 2010]

# Hypothesized theoretical framework for the study of healthcare professionals' behaviour and intention



# Limitations

- ✓ Low response rate, typical among care providers
- ✓ Proxy measures not necessarily accurate indicators of actual performance (Hrisos 2009)
- ✓ Cross-sectional: causative aspects remains untested
- ✓ High  $R^2$  scores?
  1. Within range of studies (Godin 2008, Bonetti 10, Eccles 07)
  2. Possible response bias (demographics comparable with available data)
  3. Better formulated survey questions? (informed by focus groups and previous questionnaires)
  4. A different professional group? (Godin 2005)

# Conclusion

- Psychological models can be useful to understand and predict clinical behavior among chiropractors
- Results provides an empirically-supported, theoretical basis for the design of quality improvement strategies to favour adoption of evidence-based practice by targeting relevant predictive factors

# Future directions

- To design/test an intervention to change professional behaviour among chiropractors found to have a high baseline x-ray utilisation rate based upon:
  - theoretical models, empirical data, evidence-based behaviour change techniques.
- Interventions that includes both motivational components to increase levels of cognitions and strategies to bridge the intention-behaviour gap may have greater likelihood of success.



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# Determinants of spine x-ray use Among North American chiropractors

## PROVIDER FACTORS (US, Canada)

**Sociodemographics** gender, employment, school, years in practice

### **Key Theoretical Domains**

1. Beliefs about consequences
2. Social/Pro roles & Identity
3. Subjective norms
4. Belief about capabilities
5. Knowledge of guidelines

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## **Predictors of behavioural simulation and intention (Ontario)**

- Theory of Planned Behaviour
- Theory of Interpersonal Behaviour
- Operant Learning Theory
- Action Planning
- Personal moral norm
- Habit (SRHI)

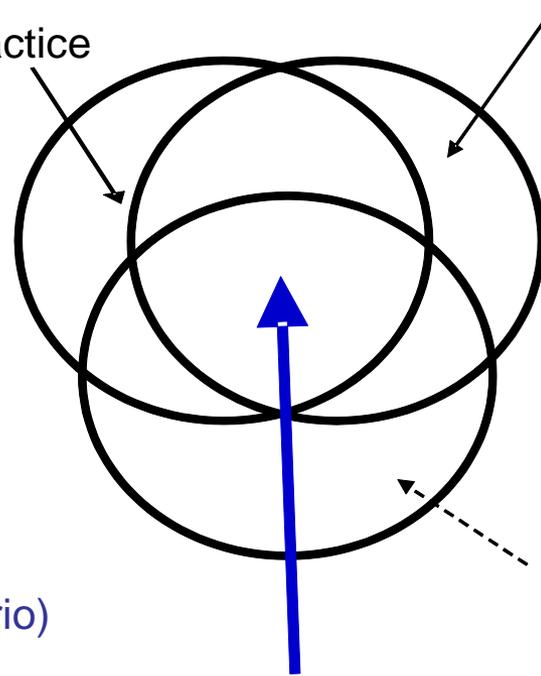
## PRACTICE FACTORS

(US practice network)

- Practice location: Midwest/South US census regions
- Office type: free standing clinic
- Practice setting: urban/suburban
- Onsite imaging

## PATIENT/SYSTEM FACTORS

- Clinical features, Care setting (practice network vs. private practice)  
Reimbursement/provider Tier  
Medical-legal environment  
Availability of MRIs, CT scans



***Decision about  
use of spine  
x-rays***