A multifaceted intervention to reduce low-value care for trauma admissions: pragmatic cluster randomized controlled trial nested in a provincial quality assurance program

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Project team

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Setting

- Inclusive trauma system 1994 – 57 adult hospitals
- Clinical registry introduced in 1999
- QI implemented in 2006
- Simple A&F every 2-4 years – mandate MoH
- Linked to accreditation
- Local trauma committee in each center
- Action plan submitted <6 months

Rationale

- Trauma favorable setting:
  - Rapid decisions from multiple clinicians with multitude of competing interventions
  - High incidence + significant practice variation
  - Quality assurance linked to accreditation
  - Routinely-collected clinical data
  - No quality indicators targeting low-value care
- Provincial authorities were planning to integrate indicators on low-value care into their 2023 evaluation cycle

<u>Unique opportunity to evaluate, refine and upscale a sustainable deimplementation intervention</u>

Overarching goal

Evaluate the effectiveness of a multifaceted intervention for reducing low-value clinical practices in acute adult trauma care

Background work

- **Scoping review** – potential low value practices
- **Systematic reviews** – benefits and harms
- **Consensus study** – selection of practices to target
- **Multicenter cohort** – validation of quality indicators for selected practices
- **Co-development** – multifaceted intervention
- **Early economic evaluation** – cost-effectiveness of multifaceted intervention

Targeted practices

JAMA Surgery

Quality indicators that can be integrated into trauma quality assurance programs using trauma registry data

Quality indicator	Frequency	Discrimination	Construct validity	Predictive validity	Forecasting
Head CT in low-risk patients	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Cervical spine CT in low-risk patients	MODERATE	MODERATE	HIGH	MODERATE	MODERATE
Whole body CT in minor or single-system injury	MODERATE	HIGH	HIGH	MODERATE	HIGH
Post-transfer repeat CT	HIGH	MODERATE	N/A	N/A	HIGH
Red blood cell transfusion in low-risk patients	LOW	MODERATE	HIGH	MODERATE	MODERATE
Surgical exploration in penetrating neck injury without hard signs	LOW	N/A	N/A	N/A	N/A
Neurosurgical consultation for mild complicated TBI	HIGH	MODERATE	N/A	N/A	N/A
Spine service consultation for isolated thoracolumbar transverse process fractures	MODERATE	HIGH	N/A	N/A	HIGH
Repeat head CT for mild complicated TBI	LOW	MODERATE	LOW	MODERATE	MODERATE
ICU admission for isolated mild complicated TBI	LOW	HIGH	LOW	LOW	MODERATE
Hospital admission in isolated blunt abdominal trauma with negative CT	MODERATE	MODERATE	LOW	LOW	MODERATE
Orthosis for A0-A3 thoracolumbar burst fracture	LOW	HIGH	LOW	MODERATE	MODERATE

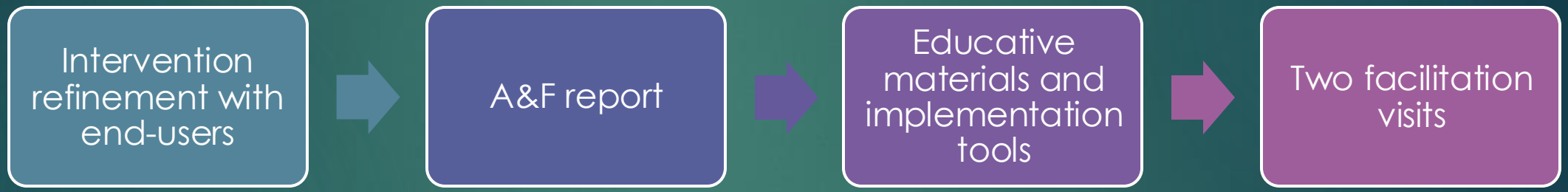
'Six quality indicators have moderate to high validity on all measurable parameters'

Moore L. *JAMA Surgery, 2022, in press*

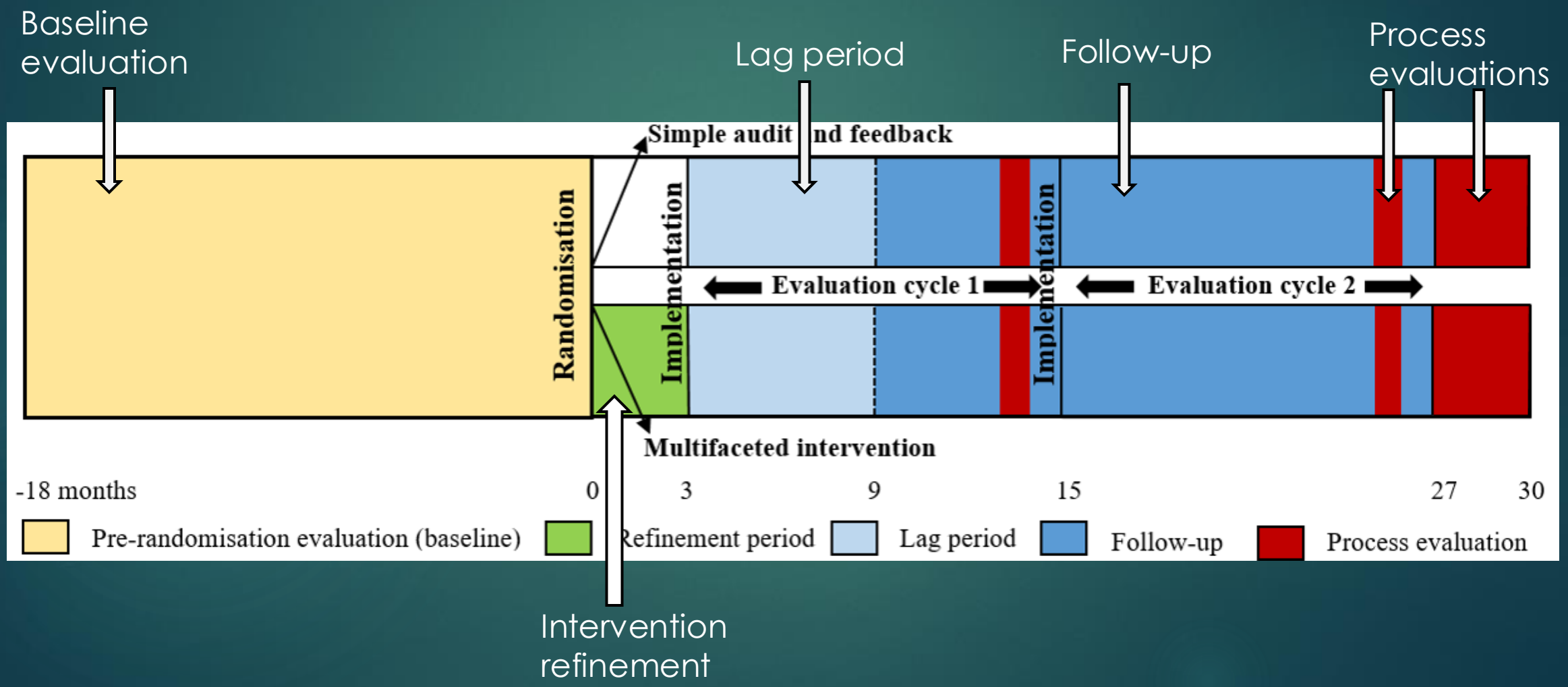
Methods

Design: Parallel-arm pragmatic cluster randomized trial
Population: 29 adult level I-III trauma centers
Intervention: A&F +
Comparator: Simple A&F (standard practice)

Intervention arm



Trial overview



IV. Synthèse de vos résultats sur les indicateurs ciblant les pratiques à faible valeur

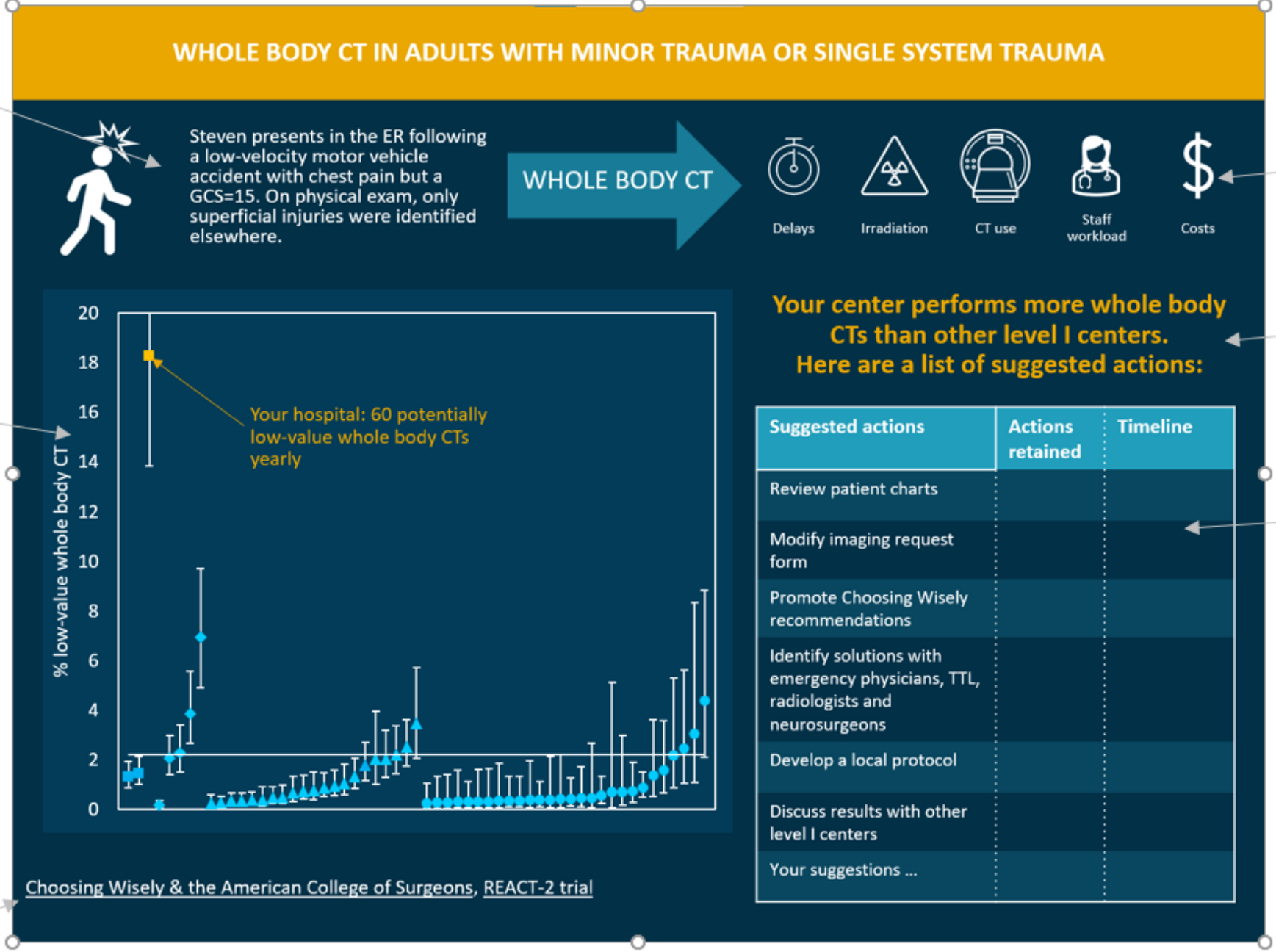
	Indicateur	Résultat	Actions
	TDM de la tête ou de la colonne cervicale chez les patients à faible risque		Analysez l'indicateur: Voir les actions suggérées
	Panscan chez les patients avec traumatisme mineur ou à une seule région du corps		Analysez l'indicateur (optionnel): Voir les actions suggérées
	TDM répétée à la suite d'un transfert hospitalier		Continuez votre bon travail! Optionnel : documentez les raisons pouvant expliquer votre succès. Vos réflexions aideront à améliorer le système.
	Consultation neurochirurgicale chez les patients sans lésion cérébrale significative		Analysez l'indicateur (optionnel): Voir les actions suggérées

Votre installation effectue moins de pratiques à faible valeur que les autres installations

Votre installation n'effectue pas plus de pratiques à faible valeur que les autres installations

Votre installation effectue plus de pratiques à faible valeur que les autres installations

5.1 Example of a page of the A&F report for one quality indicator (intervention arm)



Clinical vignette

Consequences of the practice

Performance compared to peers

Summary message indicating if action is required

Preliminary list of suggested actions (Appendix 3)

Links to supporting materials (e.g. clinical decision rules, shared decision- making tools)

5.3 Example of output from patient chart revision tool† (intervention arm)

Sample of adult patients with minor trauma or single-system injury who received a whole body CT													
#	Comorbidities	Age	Sex	ISS	GCS	Mechanism	AIS1	AIS2	AIS3	ICU	Surgery	LOS	Death
1	—	48	M	17	15	Blunt object	442205.3: Thoracic injury hemopneumothorax	450203.3	442202.2	No	Yes	3	No
2	—	22	M	9	15	Motor vehicle collision	140694.2: Brain subarachnoid hemorrhage not associated with coma > 6h	450202.2	450804.2	No	No	2	No
3	—	56	M	21	15	Motor vehicle collision	640212.4: Spinal cord contusion	650200.2	650200.2	Yes	Yes	9	No
4	Chronic pulmonary disease	54	M	9	15	Fall	442200.3: Thoracic injury hemothorax	450212.3	441407.2	No	No	2	No
5	Psychiatric history	28	M	10	15	Knife	442205.3: Thoracic injury hemopneumothorax	110602.1	416002.1	No	No	12	No
6	Alcoolism	43	M	24	—	Other	441412.4: Lung major bilateral contusion; ≥ 1 lobe in at least one lung	450203.3	10004.2	Yes	No	7	No
7	Coronary artery disease Diabetes Heart failure Obesity Renal failure	80	M	9	15	Fall	450203.3: Rib cage fracture(s) without costal flap, regardless of region, unilateral or bilateral ≥ 3 ribs (OIS Grade II)	—	—	No	No	12	No
8	—	38	F	1	15	Fall	542699.1: Ovary without further specification			No	Yes	6	No
9	Diabetes	63	F	10	15	Fall	450203.3: Rib cage fracture(s) without costal flap, regardless of region, unilateral or bilateral ≥ 3 ribs (OIS Grade II)	441407.2	442202.2	No	No	2	No
10	—	23	M	11	14	Fall	140606.3: Small isolated cervical contusion	140651.3	140682.3	No	No	5	No

AIS, Abbreviated Injury Scale; GCS, Glasgow Coma Scale; ICU, intensive care unit; ISS, Injury Severity Score

†Generated automatically from the local trauma registry interface in each center

What did we do right?

1. Recommend specific actions: list of strategies and implementation tools, priority setting, action plans
2. Choose comparators that reinforce desired behavior change: average of same-level hospitals
3. Closely link the visual display and summary message
4. Provide feedback in more than 1 way: graph, numbers, message
5. Minimize extraneous cognitive load for feedback recipients: infographics
6. Address barriers to feedback use: information on determinants and risks
7. Provide short, actionable messages followed by optional detail
8. Address credibility of the information: local champion, co-design, accreditation, publications
9. Construct feedback through social interaction: facilitation

What did we do wrong?

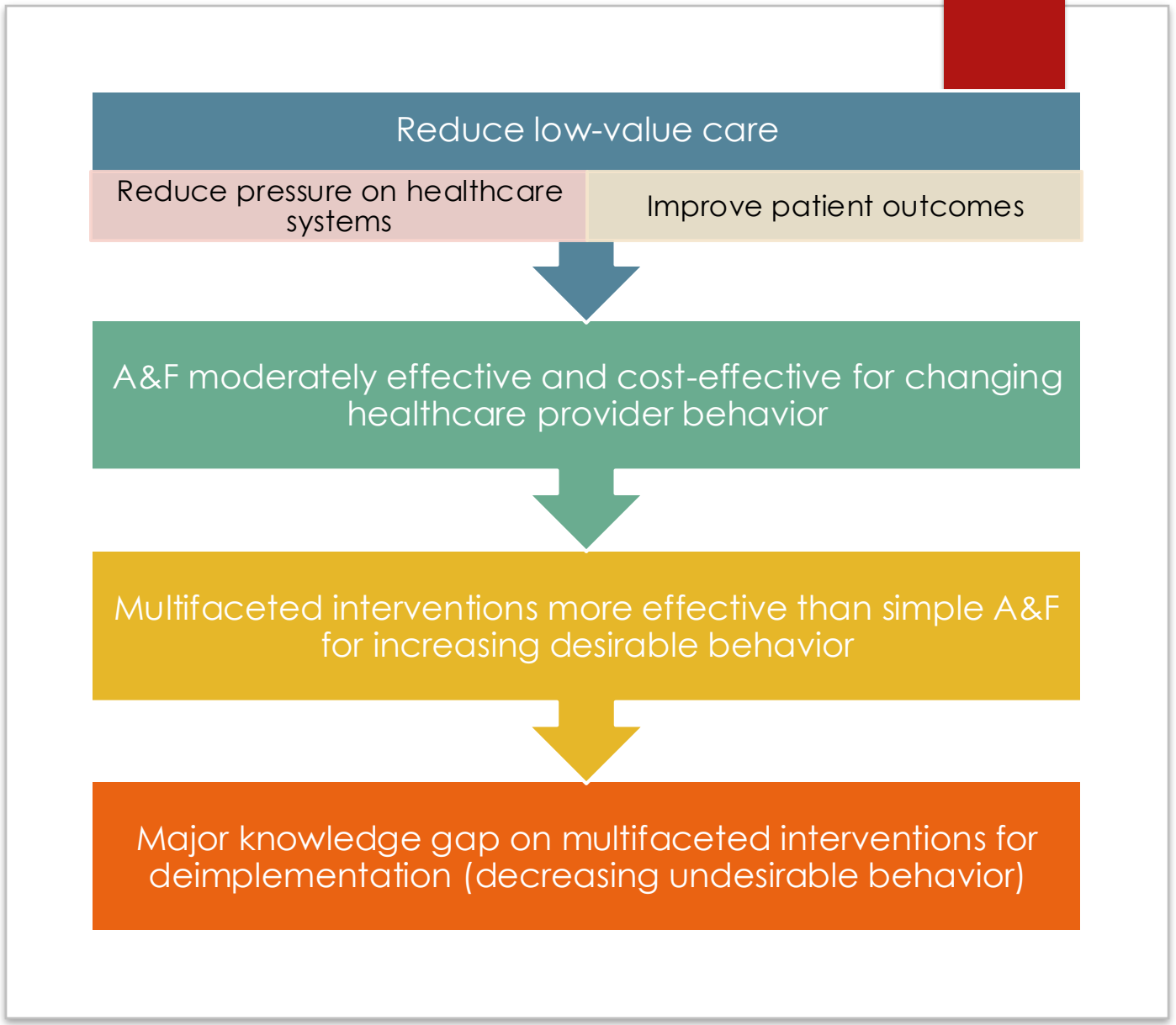
1. Recommend actions that are consistent with established goals and priorities: low-value care?
2. Recommend actions that can improve and are under the recipient's control
3. Address credibility of the information
4. Provide multiple instances of feedback
5. Provide feedback as soon as possible and at a frequency informed by the number of new patient cases
6. Provide individual rather than general data: target local trauma committees
7. Prevent defensive reactions to feedback: competitivity of level I centers

Future steps

1. Systems approach to A&F: hub and spoke model
2. Engagement in level I centers
3. Facilitation visit modalities for sustainability
4. Recommendations on case revision methods
5. Equity QIs?
6. Ecological impact?

¿ Questions ?

Rationale


Reduce low-value care
Reduce pressure on healthcare systems
Improve patient outcomes
A&F moderately effective and cost-effective for changing healthcare provider behavior
Multifaceted interventions more effective than simple A&F for increasing desirable behavior
Major knowledge gap on multifaceted interventions for deimplementation (decreasing undesirable behavior)

Pourquoi cette pratique est parfois utilisée?

- Crainte de manquer une lésion significative
- Craintes médico-légales

Quelle est la conduite recommandée?

TMD sélective (REACT-2 Trial)

Quels sont les risques de ne pas utiliser la pratique?

Aucune augmentation de mortalité, complications ou séjour comparé aux TDM sélectives (REACT-2 Trial)

Quels sont les avantages de réduire l'utilisation de cette pratique?

- ⬇ Temps de lecture radiographique
- ⬇ Irradiation
- ⬇ Découvertes fortuites non significatives
- ⬇ Anxiété chez les patients
- ⬇ Pression sur les ressources humaines
- ⬇ Émission carbones (McAlister 2022)

Trial outcomes

Primary:

- Initial diagnostic imaging (head, cervical spine or whole-body CT)

Secondary:

- Specialist consultation
- Repeat imaging for transfers
- Unintended consequences (missed injuries, unplanned readmission)
- Determinants for successful implementation (process evaluation)
- Incremental Cost-Effectiveness Ratios (economic evaluation)

Randomisation

- Independent statistician (Ottawa methods center)
- 1:1 randomization:
  - simple A&F (control)
  - multifaceted intervention (intervention)
- Covariate constrained allocation: designation level, cluster size, baseline % primary outcome

Data collection

- Provincial trauma registry:
  - Mandatory collection for all trauma admissions
  - Aggregated provincially
  - Multiple quality assurance mechanisms
  - Quality indicators validated using this data

Statistical analyses

- Intention-to-treat
- Blinded statistician
- Modified Poisson for clustered data
- Covariates:
  - Constrained allocation: volume, designation level, baseline proportion
  - Patient risk factors: age, comorbidities, injury type/severity
- Subgroup analyses:
  - Designation level, age, sex, SES

Appendix 7. Sample size calculation for primary and selected secondary outcomes

Composite outcome	Low-value practice	Centers	Baseline proportion (a/n)[a]	wpICC	CAC	Cluster-period size	Detectable difference[b]
Primary							
Initial diagnostic imaging	Head CT Cervical spine CT Whole body CT	29	14% (1163/8310)	0.044	0.984	285	3.50%
Secondary							
Specialist consultation[c]	Neurosurgical consultation Spine consultation	29	20% (607/3069)	0.045	0.836	106	7.40%
Repeat imaging for transfers[d]	Repeat CT in patients with no disease progression and no additional details needed	29	43% (608/1405)	0.186	0.995	21	16.00%

wpICC: within-period Intraclass Cluster Coefficient, CAC: Cluster Autocorrelation Coefficient

[a] Based on average 18-month proportion over 4 observation periods between April 1st, 2017 and March 31st, 2020 using trauma registry data from the *Quebec Trauma Care Continuum*

[b] Detectable absolute difference with 90% power

[c] Includes consult requested in level I/II emergency department and transfer to level I/II center for consult requested by level III center

[d] Includes CT I/II centers post-transfer and CT in level III centers for patients with a clear indication for transfer

Process evaluation

Fidelity

- Record intervention delivery
- Download of educational materials
- Examine action plans

Reach

- Strategies used to disseminate feedback
- Implementation challenges
- Unintended consequences
- Recall and understanding of feedback and actions taking

Contextual factors

- In-hospital: e.g., competing priorities, support and commitment of decision makers, available resources
- Outside the hospital: e.g., national initiatives, policies, discussions with HCPs in other centers

Protecting against biais

- **Allocation concealment**
  - sequence generated by blinded statistician ✅
  - allocation by independent INESSS professional ✅
- **Blinding**:
  - local trauma committees ?
  - data extractors/analysts ✅
  - investigators ❌
- **Indication/recruitment**: all eligible participants included ✅
- **Attrition**: complete outcome data ✅
- **Imbalances between arms**: covariate constrained randomisation ?
- **Non-adherence**: intervention mandatory ?
- **Contamination**: intervention refinement post-randomization ?

Intervention refinement: focus groups

Participants: Local trauma committee members in level I-III trauma centers (intervention arm)

Sample size: Four focus groups (2 level I, 1 level II, 1 level III) of 4-6 participants

Data collection: Meetings will be audio-recorded and transribed

Outcomes measures: Barriers and facilitators

Data analysis: Inductive and deductive content analysis applying the Consolidated Framework for Implementation Research

Facilitation visits

Participants: Medical Director and Trauma program manager in level I-III trauma centers (intervention arm)

Sample size: Four focus groups (2 level I, 1 level II, 1 level III) of 4-6 participants

Data collection: Meetings audio-recorded and transribed

Outcomes measures: Barriers and facilitators

Data analysis: Inductive and deductive content analysis applying the Consolidated Framework for Implementation Research