



# Root cause analysis

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FANC, 2018-06-02

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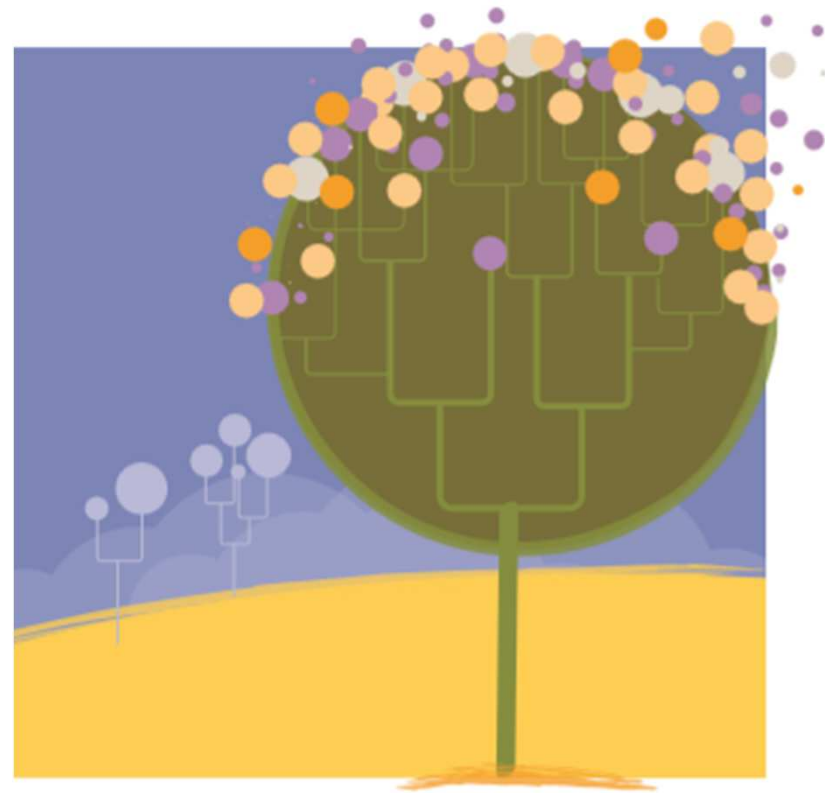
***To achieve a safety culture  
with regard to the radiation protection  
of the patient***



# Root cause analysis

## « *Méthode de l'arbre des causes* »

*Because there is no single-cause accident, the causes of an accident are often as numerous as the branches of a tree.*






# 2 types of accident analysis

## Quantitative

Based on statistical data

## Qualitative



In-depth analysis of a particular accident case, by the method of the root cause analysis



# Quantitative analysis

- Based on **statistical data**
- **Large number** of accident cases
- Provide an **overview of the risks of accidents**
- Set the **overall priorities**
- **Good communication tool**



But **insufficient**

- to make a **good safety diagnosis**
- to define a **prevention policy**

# Qualitative analysis

**In-depth analysis of one particular accident case**  
consisting in :

- looking for **accident factors beyond the work situation and operator behavior**. It does not stop at the events closest to the damage and goes back as far as possible to the organization of the system ;
- creating an **open debate about the accident**. This collective discussion makes it possible to evolve from "*Why the accident ?*" to "*What to do to prevent it from happening again ?*"



# Qualitative analysis

and makes it possible to :

- **open up the scope of possible preventive measures** without limiting itself to individual protection measures and to the reminding of instructions;
- **communicate widely** thanks to the support of a **graphic representation.**





# Root cause analysis

## « *Méthode de l'arbre des causes* »





- Developed in the years 1970 by the National Institute of Research and Security, **France (INRS)**.
- Practical method of **finding facts that have contributed to the occurrence of the accident.**
- As a **systemic approach**, it considers the **accident as the result (symptom) of a malfunction of a system** (company, organization, process,...)





# Root cause analysis

## « *Méthode de l'arbre des causes* »

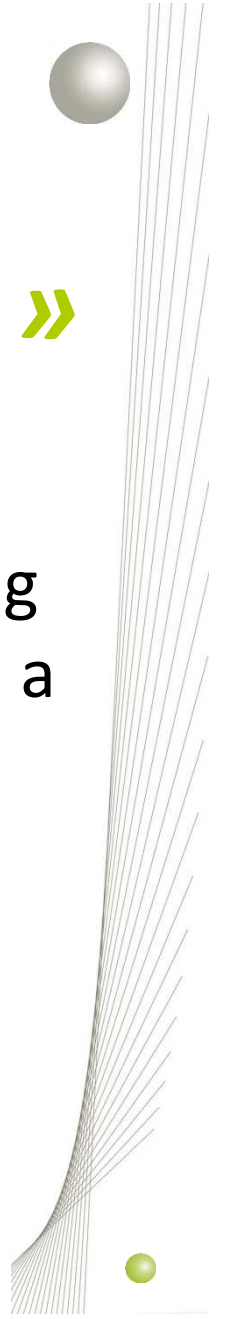
- To understand the accident, it **investigates all the components of the system** (technical, organizational, human) **and their interactions**.
  - Fact-oriented, it helps to establish the **filiation of the causes to their effects**.
  - It considers both the **usual facts** and the **variations**.
  - It highlights the **multi-causality** of unwanted events.
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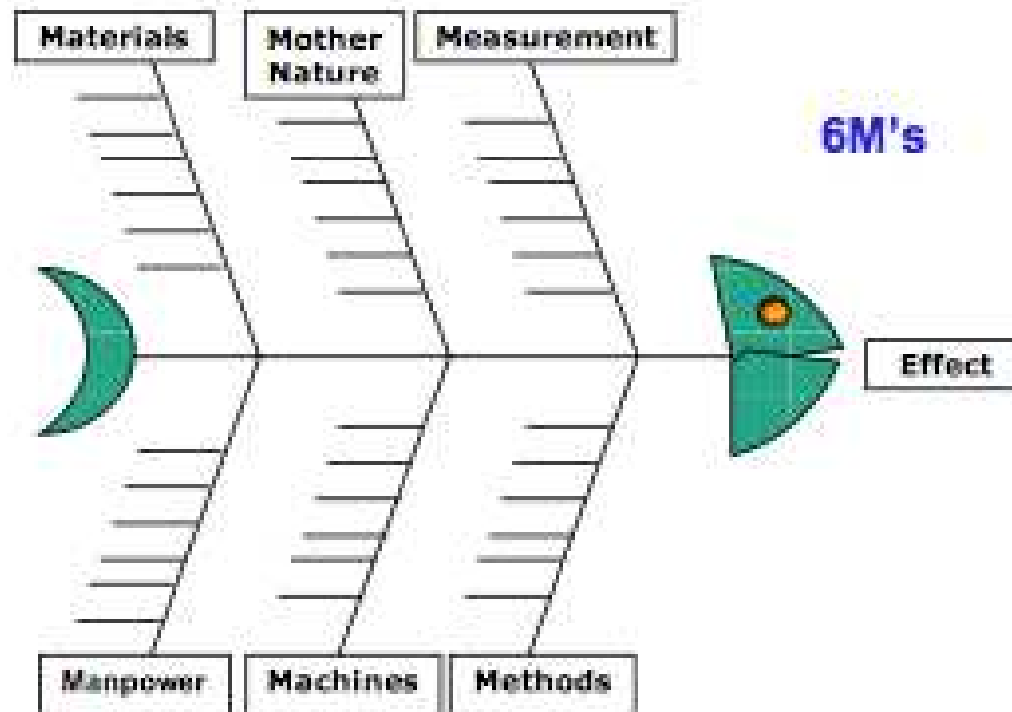
# Root cause analysis

## « *Méthode de l'arbre des causes* »

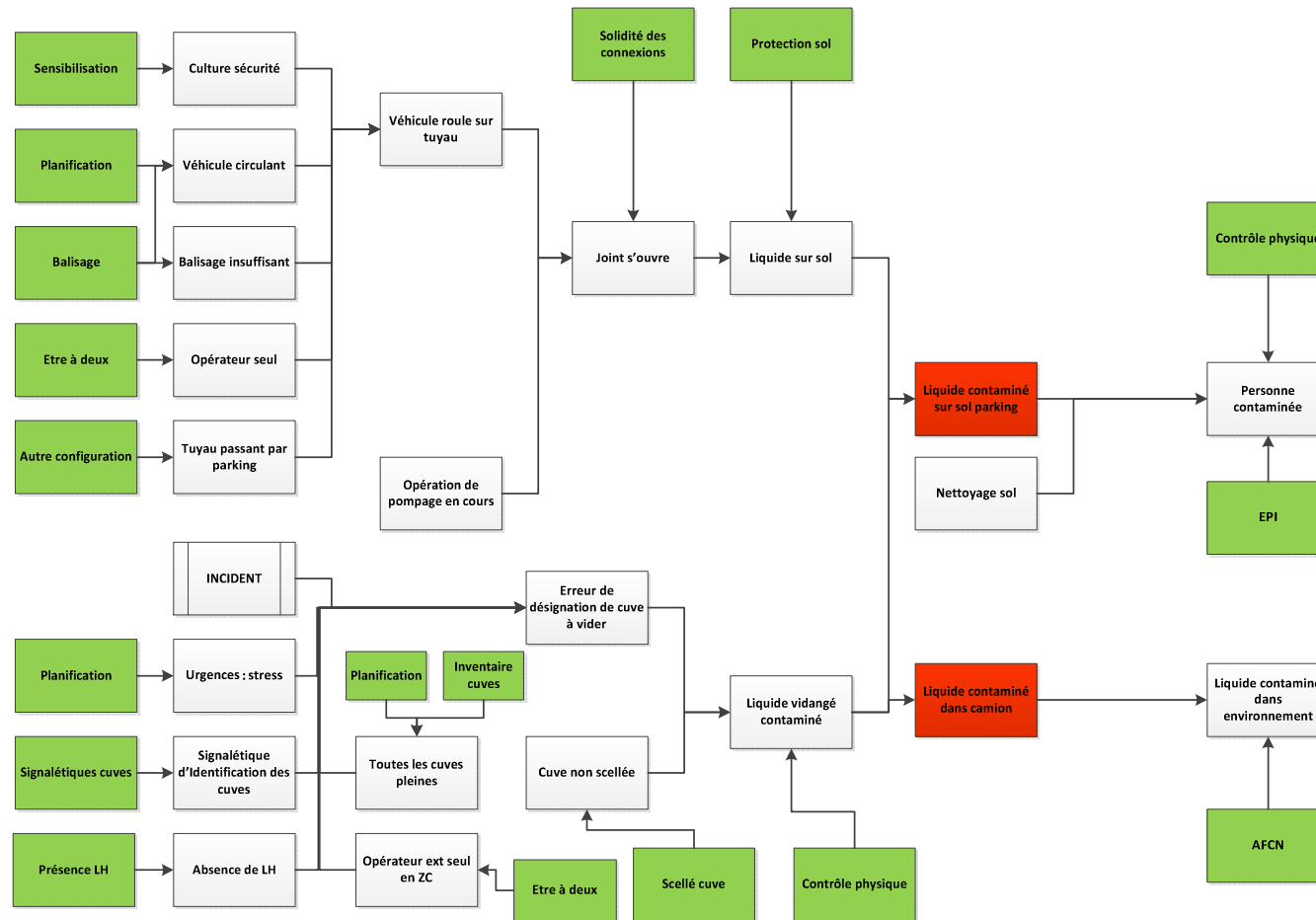
- used in the field of occupational risks to better identify **a posteriori** all the necessary facts resulting in an undesirable event (accident of work, but also a failure of a process, etc...)
- The main issue is to design a cause and effect diagram (in the form of a tree).



# Fishbone diagram





# Root cause analysis (RCA)





# Root cause analysis of an incident

This analysis is a **collective work** consisting of:

1. **Conducting the survey;**
  2. **Collecting relevant data;**
  3. **Building the tree of causes (= only a tool !);**
  4. **Finding corrective measures;**
  5. **Finding out if similar risks exist elsewhere in the institution;**
  6. **Proposing appropriate measures;**
  7. **Checking their application.**
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# 1. Conducting the survey

Two major sources of information are to be considered:


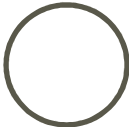
- The information obtained in the context of **observations on the working environment** (machine, tool, context..);
- Those obtained in the context of **interviews** with the victim, witnesses, management, colleagues...

They are **collected as soon as possible** after the occurrence of the accident and where possible **at the accident site**.

## 2. Collecting relevant data

Differentiate the **interpretations** of the **relevant facts** because only the latter are used.

Among all the facts selected, it is necessary to distinguish between :

- **the usual facts known as "states"**  contribute to the realization of the accident without triggering the process leading to the injury.
- **The unusual facts called "variations"**  which constitute the essential information necessary for the dynamics of the accidental process.

## 2. Collecting relevant data

The accident may occur when **performing unusual actions** or by an **unusual combination of usual actions**.

This character of "change" will guide the analysis.



## 2. Collecting relevant data

Causes = **facts** ! No interpretation, no value judgement.

Not a hunt to catch the guilty ! Needs diplomacy.

No "negative facts", corresponding to what would have been necessary to avoid the accident.

Considering an observation grid, for example :

- Individuals, **T**asks, **M**aterial, physical and social **E**nvironment (*ITaMaMi*)

Other grids: HEEPO, 5 M,...

= > cause chain diagram by specifying the bindings **in a logical and chronological order.**

# 3. Building a tree of causes

From the **ultimate fact**.

By looking for the direct links between this ultimate fact and the different backgrounds, asking the following questions :

- What is the **cause** of this?
- Was this cause **necessary** for the occurrence of this fact ?
- Was that cause **sufficient** ? If not, what are the **other causes themselves necessary** ?

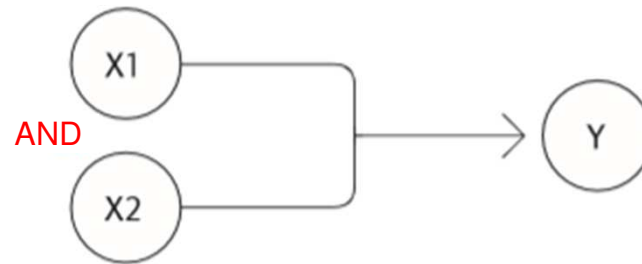
# 3. Building a tree of causes

Three types of logical links between the facts :

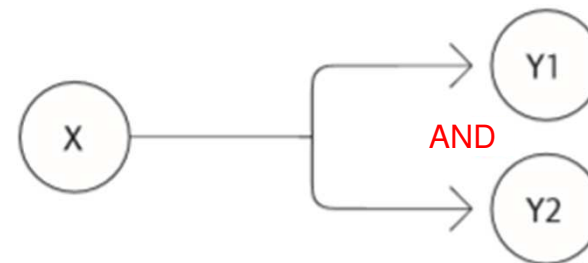
**Chain** : only one cause was necessary and sufficient for the fact to happen.



**Conjunction** : one fact has several causes.



**Disjunction** : one antecedent may have several different consequences.

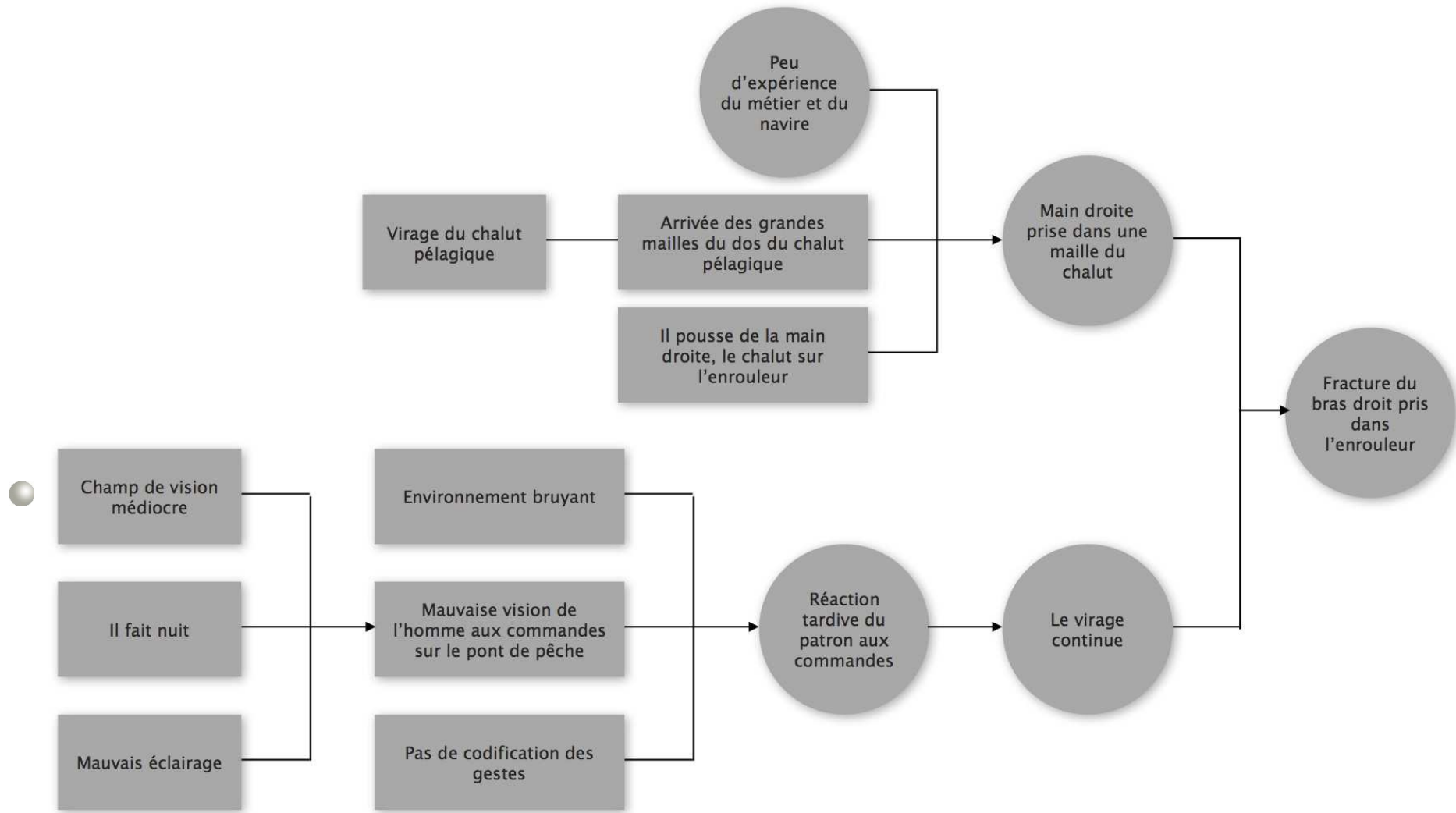


# 3. Building a tree of causes

At each step, check for **logical coherence** :

- A) If the cause had not arisen, would the fact have arisen ?
- B) For the fact to appear, did it take this cause and only that cause ? (Chain or conjunction ?)

# Exemple



## 4. Finding corrective measures

Because **each fact** retained in the cause tree is necessary to the occurrence of the incident, it **becomes a target for preventing the recurrence** of the incident.

**A time for imagination followed by a time for choices.**

The solutions selected are to be evaluated according to their level of prevention.

# 4. Finding corrective measures

So the selected solutions are to be preferred in the following order :

**1. Eliminating the dangerous situation.**

**2. Elimination or reduction of risk :**

**1. Protection at the source ;**

**2. Collective protection ;**

**3. Personal protection ;**

**4. Maintain de risk :**

**1. Training;**

**2. Information;**

**3. Instructions.**



## 5. Looking for similar risks elsewhere in the institution

To **generalize to the whole organization/institution** the solutions arising from the analysis of an incident or

the **comparative analysis of several trees of the causes (repetitive causes)**



## 6. Proposing appropriate measures

Estimation of the effectiveness of the proposed measure, taking into account :

- **level of prevention (cf. supra);**
- **stability (in time);**
- **additional workload for workers;**
- **guarantee of non-displacement of risk;**
- **possibility of widespread application;**
- **time to apply;**
- **compliance with the legislation;**
- **the cost.**
- **etc..**

# 6. Proposing appropriate measures

At the most one goes back into the tree,  
at the most the measure is **influential** and it **concerns the organization** of the institution (**Root causes** or « *causes profondes* »).

# 7. Checking their application

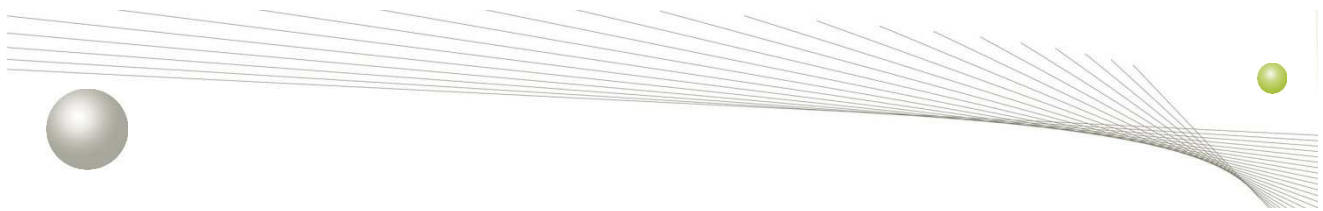
- Often neglected.
- Dashboards, audits, controls.
- Efficiency.
- Stability in time.
- Regular reviews.

# Conclusions

- The challenge of the methodology is to stay systematic in its application.
- The real purpose is implementation of corrective measures.
- Time consuming >< investment in safety.
- Applicable to accidents, incidents, near incidents, unwanted events...
- These analyse and dialogue in the organization Improve its values and its safety culture.
- More and more asked by the regulator...

Thank you





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# 1 or 8 incidents ?

**Chest X-Ray  
(PA-Lateral)**

**Chest CT  
(CT-simulation)**

**CBCT (RT)**

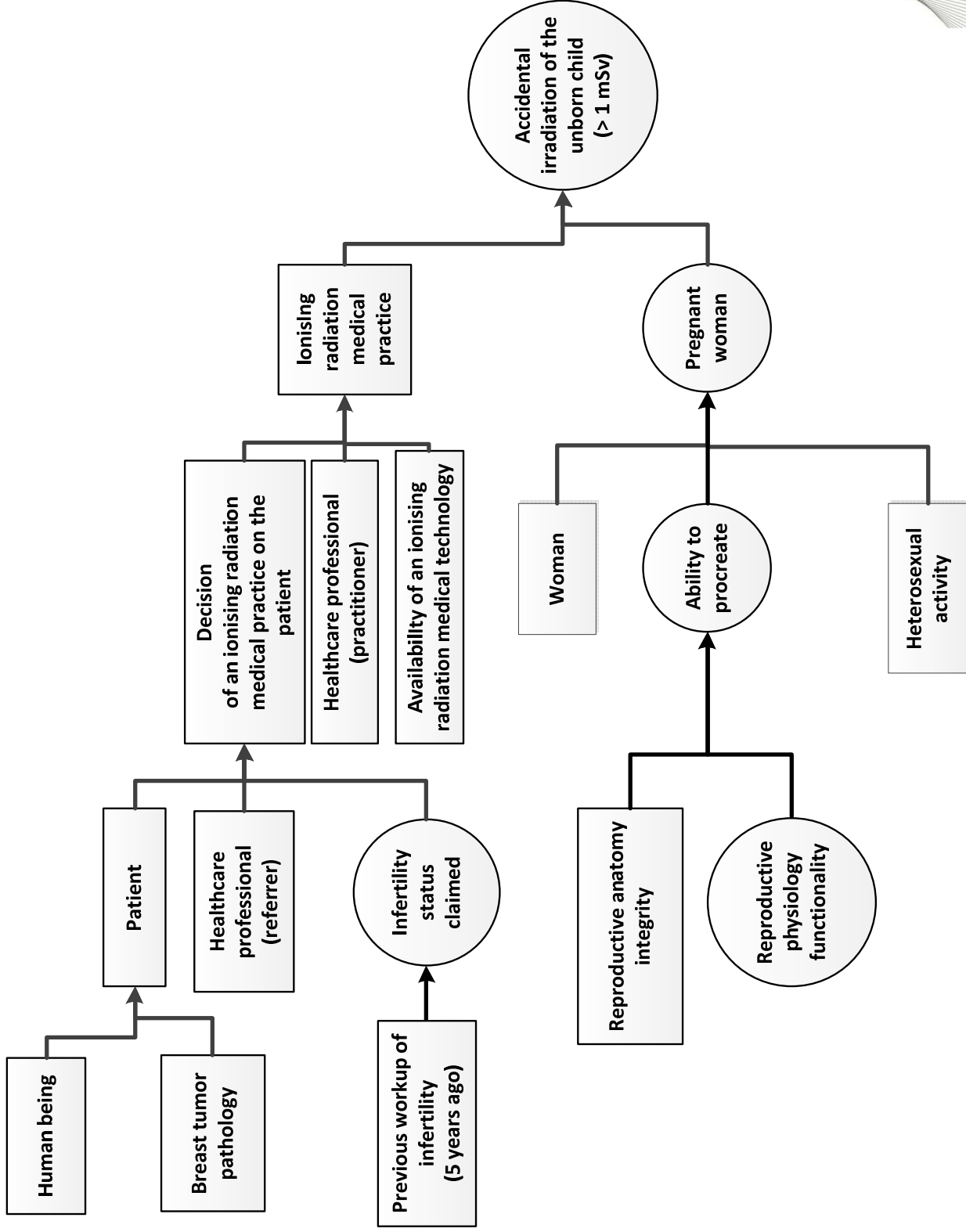
**Bilateral  
mammography**

**Radiotherapy**

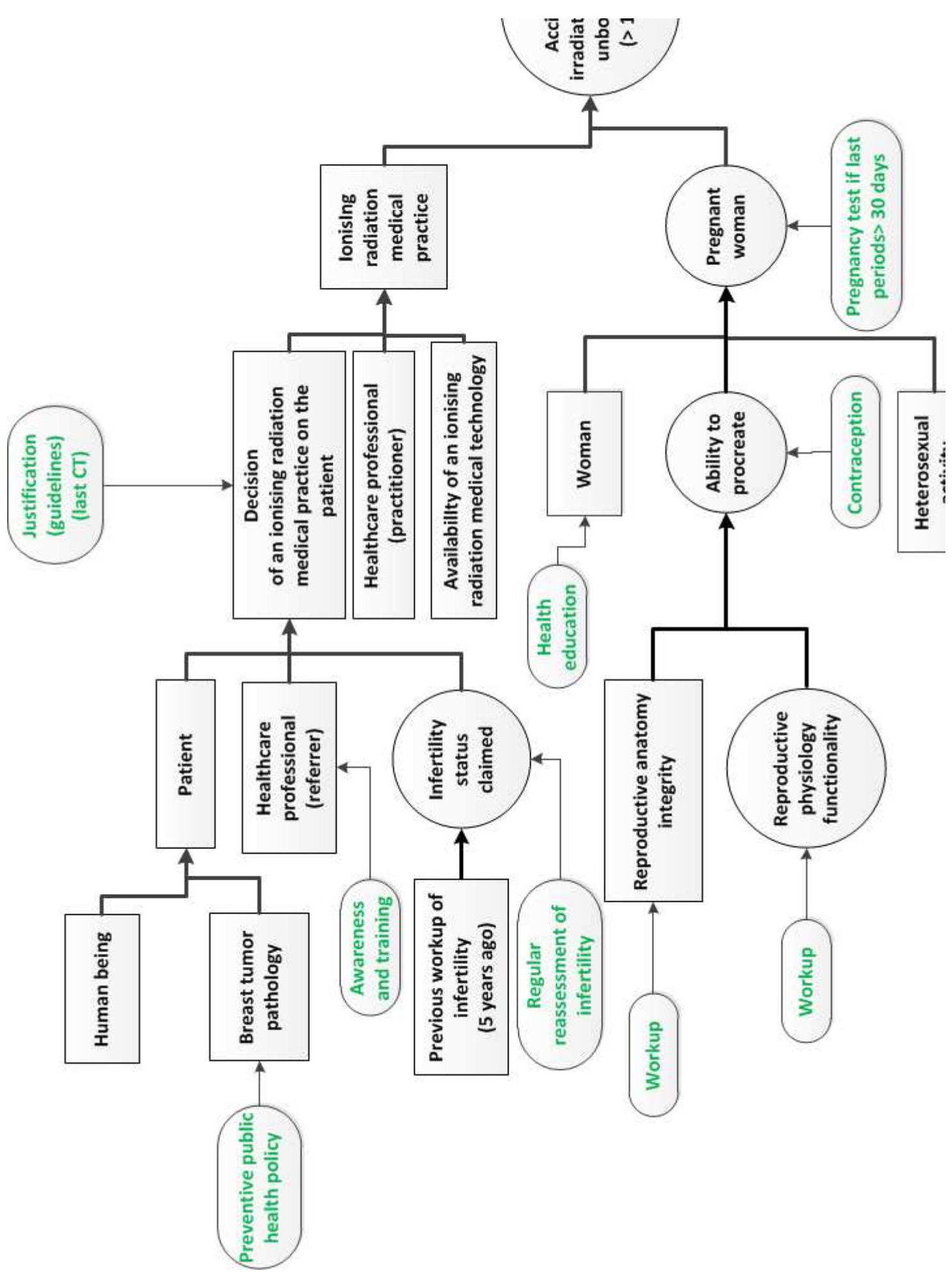
**Abdominal CT**

**Sentinel node  
Tc-99m**

**Bone scintigraphy  
+ Tomo**



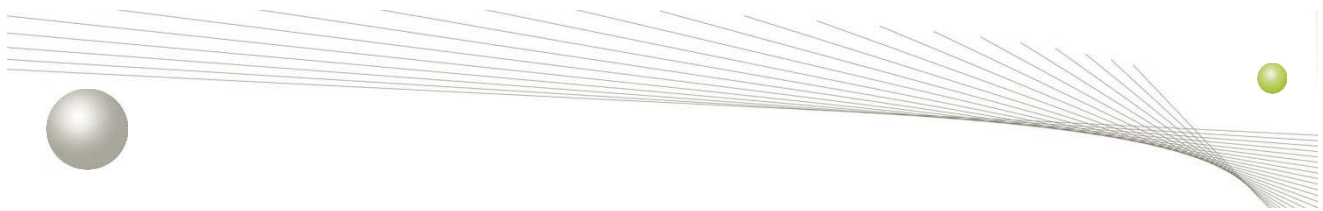




**Posters in waiting rooms and  
undressing rooms**

**To ask date of last periods  
at 1st consultation**

**In case of doubt and of refusal of the patient for a  
bHCG test, the patient gives her approval to adapt the  
dose and the treatment preventively.**



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