A method for evaluating weaknesses and critical steps in the Radiation Treatment Process through Precursor Events reporting

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1. Objectives:

To establish a method based on the reporting of Precursor Events (PE) to detect and to assess weak steps in the Radiation Treatment Process. These steps are categorized according to Work Domains, functional Basic Responsibilities and levels of Severity of Precursor Events.

2. Methods:

The operational Quality System used in the Radiotherapy Department is based on the spontaneous declaration of Precursor Events by the staff.
The Radiation Treatment Process is subdivided into 7 main steps grouped within 4 Work domains and assigned to a functional Basic Responsibility.
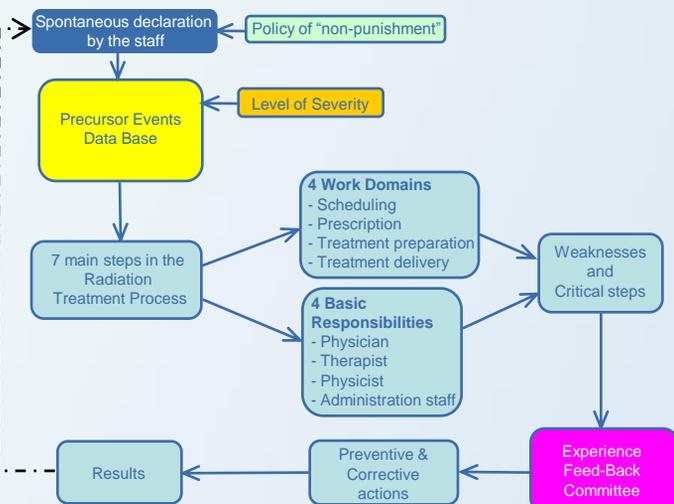

Figure 1: Procedure for reporting and analysis of Precursor Events

3. Results:

Our analysis is based on 2026 PE reported during a period of 22 months with an average of 92.1 PE/month. During this period, 3398 patients successfully reached the end of their treatment and passed through all the steps of the Radiation Treatment process.

We observed a progressive decrease in the number of PE reported and the Mean level of Severity remains stable (mean value of 3.7). This can be explained by the implementation of corrective actions which have often an impact on many other subjects than the one initially treated.
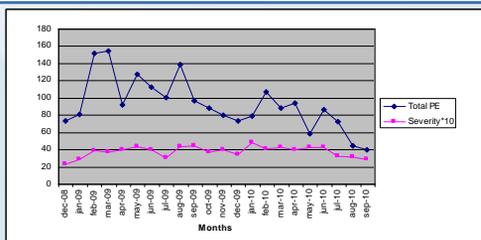

Figure 2: Distribution of Precursor Events vs Mean level of Severity per month

The care Process in radiotherapy is very complex. Many factors at the origin of exposing patients to unwanted events are linked to the interaction of human acts and decisions. One has to account the interplay between various professionals from different fields.
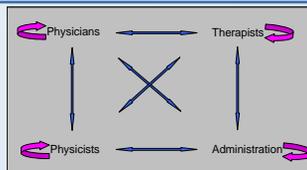

Figure 3: Schematic flow reporting of Precursor Events

It appears that the medical sector is at the origin of, or frequently associated with the severity of Precursor Events reported.
Physicians appear not only during certain stages of the Radiation Treatment process but rather throughout the care of patients, in contrast of other sectors.

Table 1: PE classification according to Basic responsibilities ordered by Mean level of PE severity

Basic Responsibility	Mean level of PE Severity	Total % PE	Cooke DL *et al** classification
Physician	3,5	32,7	Serious
Physicist	3,0	33,6	Serious
Administration staff	2,5	19,6	Minor
Therapist	1,9	14,1	Minor

We highlight critical steps by taking into account the Severity of scores assigned to each Precursor Event. This additional information is essential to Quality Management in order to justify the rank and sequencing of preventive and corrective actions.

Table 2: PE classification according to Work Domains ordered by Mean level of PE severity

Work Domains	Mean level of PE Severity	Total % PE	Cooke DL *et al** classification
Prescription	4,2	14,5	Serious
Treatment Delivery	2,8	16,0	Minor
Scheduling	2,7	19,6	Minor
Treatment Preparation	2,5	49,9	Minor

Our study shows that by assigning to each step in the Radiation Process a functional responsibility, the distribution of Precursor Events among the different sectors becomes more homogeneous compared to the one obtained if analyzed according to the work domain.

4. Conclusion:

The use of information coming from the spontaneous declaration of Precursor Events by the staff provides a powerful tool for the Quality Management to highlight weaknesses in the Radiation Treatment Process in order to prevent potential clinical incidents and to launch the most effective actions against basic causes of Precursor Events.

* Cooke DL *et al.* 2006. A reference guide for learning from Incident in Radiation Treatment