DEVELOPING AND IMPLEMENTING SAFETY CULTURE IN THE USES OF RADIATION SOURCES

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Abstract

This paper presents an approach to develop and implement safety culture in the uses of radiation sources in medicine, industry, agriculture, research and teaching, and makes reference to the experience gained by the industries where that culture has been developed and improved, i.e. the nuclear industry.
Suggestions to assist progress toward safety culture are here described for regulators, organisations using those sources, and professional associations. Even though emphasis is given to small organisations or teams of workers, this approach may be also useful to greater organisations like industrial irradiation companies or governmental research laboratories. In each case, parties being the principal focus of the learning process toward a progressive safety culture should be identified.

1. Introduction

The International Nuclear Safety Advisory Group (INSAG) [1] described two general components of safety culture: *a framework in the organisations that is created by management, and an attitude of staff at all levels in responding to and benefiting from that framework.*

The development of those components is of mayor importance regarding the widespread uses of radiation sources in medicine, industry, agriculture, research and teaching. Safety culture and feedback from experience are of critical significance for the prevention of radiological accidents involving these sources [2-4], and are helpful to deal with the problem of orphan radioactive sources [5].

Orphan radioactive sources are those sources out of control of the user or the Regulatory Body. Those sources may have been misplaced, discarded, lost, or stolen, and in some cases the Regulatory Body may have no notice about them until an abnormal situation occur [6].

A well developed and implemented safety culture is essential. Inadequate training of the staff, mishandling of sources, poorly defined procedures and lack of a questioning attitude, are some of the most important lessons learned from accidents.

2. Remarks on safety culture

Industrial radiography teams or companies, nuclear medicine services, industrial plants using few industrial gauges, are examples of small organisations whose staff have only the necessary technical knowledge to manipulate the sources. Irradiation plants, nuclear pharmacies, hospitals, are in turn examples of greater organisations with skilled professional and technical staff working under well established operational procedures.

A number of countries have only small sized organisations or teams of workers using radiation sources. Translation to them of the practical experience in safety culture gained in the nuclear industry [1,7,8], requires careful consideration of the particular social and economical context which they work in.

The small size of those organisations and their unfavourable working environment may not guarantee sound internal discussions or appropriate learning conditions on safety issues.

Inappropriate attitudes at both individual and staff level may compromise their commitment on safety culture development and implementing.

In these cases, as safety culture recommendations alone may not convince individuals to adopt the behaviour needed, social mechanisms will have to be set in place to promote individual commitment [9].

Universities and professional boards may promote learning process to assist safety culture development, and ethics review committees in medicine should address safety issues to certify standard quality in medical treatments using radiation sources.

Discussion meetings, technical refresh courses, and periodic update communications in professional boards and associations, should play for the individuals working in small organisations, the role assigned by safety culture to the upper-down and bottom-up communications in large organisations.

Concepts like organisational culture, unity of purpose among employees, behaviour of employees toward each other and toward others external to the organisation, should be adapted and made suitable to the size, diversity and environment of small or even unipersonnel organisations.

3. Social mechanisms

In order to help to overcome those drawbacks on safety issues of small organisations, the regulatory body should focus its attention on the unions or associations formed by them. As memberships of the unions, the organisations are parts of an extended network with similar interests and difficulties.

Each of these networks may be considered as the subject in the concepts of vision, mission, goals and values of safety culture. The sense of accountability of the organisations in the network would help to promote safety improvement nation-wide.

Institutions engaged in research & development activities in medical and industrial uses of radiation sources, should support safety culture development and implementation in these networks. Working jointly with regulators, these institutions should provide sufficient scientific and technological context for progressive updating of the staff of small organisations.

This approach is being implemented successfully in Argentina, and these are some examples:

1. The National Atomic Energy Commission and the Ministry of Public Health working together with professional associations of radiotherapists and phycisists, conduct since the sixties programs aimed at promoting medical excellence and radiological safety in teletherapy

2. Annual nation-wide intercomparisons of dosimetric methods in teletherapy are being launched in that context.

3. Discussion meetings with organisations working in industrial gammagraphy, with nuclear medicine professional associations, etc., are being conducted periodically by the Nuclear Regulatory Authority in order to promote safety culture in those practices.

4. Stages of development of safety culture

National policies are a necessity to boost the development and implementation of radiological safety and security in the organisations responsible for the uses of radiation sources. In particular, in the case of small organisations, teaching institutions and professional associations should occupy significant roles to support learning processes.

Management and technical staff responsibilities in these organisations usually are not clearly defined. Highly skilled professionals or technicians are the exception, and in general the

technical staff have only the necessary knowledge to deal with their work. These organisations do not facilitate training and periodical retraining of their staff, and they lack of a policy to disseminate information on safety issues.

Understanding of safety culture and self diagnosis of its stage of development may be difficult in their environment of economical urgencies, small number of employees, and other adverse constraints. Professional associations should help organisations and individuals in their understanding of safety issues, and should provide an appropriate environment for „horizontal" communications between them.

The following classification of stages of development of safety culture in small organisations, is descriptive and not rigid. At any time they may exhibit a combination of the following main characteristics of the stages.

Stage i - *Safety issues are not fully addressed by the organisation.*

Stage ii - *Safety issues are addressed mainly to comply with regulations or as a formality.*

Stage iii - *Good safety performance becomes an organisational and individual goal.*

5. Actions toward safety culture

The suggestions in Table I are examples of some actions aimed at assisting organisations in their progress toward higher stages of development of safety culture.

They are directed to managers, owners, professionals, or anyone occupying top positions at an organisational structure, and are listed for stages i and ii previously mentioned.

Table I - Suggestions to assist progress toward safety culture in the uses of radiation sources

Stages	Suggestions
i to ii	*Require support from other organisations (professional associations, regulators) to review or formulate safety policy, and communicate that action to the staff.*
	establish safety training of the managerial level and the staff
	facilitate employees participation in the activities of professional associations.
	introduce regular review of safety and seek for employee's suggestions in order to identify areas of improvement, with emphasis on safety and security of spent sources.
	make employees aware of safety issues as part of quality performance.
ii to iii	*make employees aware of strategic goals that relate quality and safety to long-term profits or redits.*
	make employees aware of other organisations who have successfully improved their safety performance, to demonstrate that achievement is possible.
	Review safety performance and make employees aware that safety is not only a technical issue. Promote a questioning attitude to prevent the problem of orphan sources
	Facilitate cross communications with similar organisations and start collaborative work with regulators.

6. Errors as a learning opportunity

Employees at small organisations should be encouraged to report human errors during operations. Even though economical difficulties normally experienced by these organisations compromise their commitment on safety culture, manager should promote employee participation in professional boards and associations to discuss and learn lessons about their experience.

Special attention should be paid to cognitive mechanisms as they determine the extent to which questioning attitude is retained during operations [7]. When the individual is experienced the operations become automated to such an extent that they no longer require conscious control.

7. The role of the Regulatory Body

The Regulatory Body should conduct a review of the factors in the national culture that may have significative influence in the developing and implementing of safety culture, and should promote programs aimed at assisting small organisations in the cultural changes their staff must undergo.

It should also consider the following points:

- retaining its role as driving force toward safety culture in the uses of radiation sources,
- increasing its attention on safety issues during compliance monitoring at small organisations,
- following up any radioactive source whose safety is not fully guaranteed, or is not longer in use,
- implementing a sound enforcement program helpful to prevent radioactive sources ending up in the public domain,
- disseminating among the licensees information on enforcement actions and penalties.

The Nuclear Regulatory Authority in Argentina has an extensive experience gained in the control of radiation sources, and as described in Section III it has successfully promoted actions toward safety culture in the small organisations. It has also implemented monitoring compliance [10] and enforcement [11] programs whose practical guidelines are aimed at the prevention of radiological accidents. Special attention is paid in these programs to indicators of problems of orphan or spent sources, and immediate actions are taken to provide for their safety and security.

8. Conclusions

An approach based on actions by Regulatory Bodies and by some social mechanisms may be helpful to facilitate the implementation of safety culture in small sized organisations working with radiation sources. In particular, this approach would be useful to prevent radiological accidents and to deal with orphan radioactive sources.

These actions of social mechanisms, according to national peculiarities, rest on the role the professional boards and associations should play. They should provide small sized organisations and individuals with a suitable environment for cross communications, technical updating and learning on safety issues.

Some actions described here may help the organisations to achieve higher stages of development of safety culture. A questioning attitude of the staff may prevent the problem of orphan sources.

The Regulatory Bodies should probably retain during a long time a leading role promoting safety culture, and should also have monitoring compliance and enforcement programs aimed at detecting and securing spent and orphan sources. They should also consider disseminating information on enforcement actions to licensees.

9. References

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