POINT OF VIEW

Occupational risk prevention in endoscopy units: a pending issue

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ABSTRACT

The degree of knowledge and compliance with occupational risk prevention measures in the Spanish gastrointestinal endoscopy units is unknown.

Aim: 1. To assess compliance with occupational risk prevention measures in GIE units. 2. To determine which factors influence the fulfillment of occupational risk prevention measures.

Methods: a validated survey was supplied to 300 GIE units, including questions on: 1. General occupational risk prevention measures; 2. occupational risk prevention measures during disinfection; 3. occupational risk prevention measures during examination. The following Hospital or GIE Unit characteristics were evaluated: Type of hospital according to the Spanish National Health Service; Number of hospital beds; Advanced diagnostic and therapeutic procedures performed and; Centers providing training in the field of endoscopy.

Results: response: 196 GIE units (65%). 104 GIE units (53% CI95%: 46-60) fulfill less than 50% of the occupational risk prevention measures studied.

The RR of less than 50% of the ORP measures being fulfilled is 1.975 times higher at public hospitals than at private facilities (CI95%: 1.11-3.52). None of the remaining factors analyzed proved to have a significant influence.

Conclusions: compliance with occupational risk prevention measures in Spanish GIE units is inadequate and must be improved. Public hospitals in Spain comply with fewer occupational risk prevention measures than their private counterparts.

Key words: Occupational risk prevention. Personal protective. Endoscopy organization.

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INTRODUCTION

Occupational risk prevention (ORP) can be defined as a set of measures aimed at avoiding or reducing physical or psychological harm resulting from production processes. Both employers and employees should be aware of this issue and comply with its requirements. In recent years and due to high occupational accident rates in developed countries, governments, employers and workers' unions have shown increasing concern regarding ORP issues.

This concern has translated into a range of laws that establish and regulate the responsibilities and duties of the parties involved in production processes. This legislation must also be observed by the healthcare provision industry, itself a production process.

The nature of gastrointestinal endoscopy GIE units makes them high risk areas for occupational accidents. Some of the common injuries sustained by GIE unit staff include De Quervain's tenosynovitis, cervical and lumbar pains, skin or mucosa injuries due to contact with disinfectants, pulmonary diseases caused by inhaling toxic gases from disinfectants and infections resulting from accidental pricks or cuts inflicted by contaminated instruments.

To date, there has been very little research to assess the awareness and compliance with ORP measures on behalf of healthcare professionals in general and of GIE unit staff in particular.

Therefore, the aim of our research was to establish the degree of awareness and fulfillment of ORP regulations in Spanish GIE units and to establish which factors determined their fulfillment.

MATERIAL AND METHODS

A survey was conducted among 300 gastrointestinal endoscopy (GIE) units from Spanish hospitals randomly selected from the Official Hospital Index of the Spanish Health Ministry, which includes 785 hospitals.

Table I. Hospital and GIE unit characteristics

<i>Hospitals characteristics</i>	<i>No. of Hospitals (%)</i>
Hospital Type	
Public hospitals	108 (55%)
Private hospitals	88 (45%)
Hospital size	
Small (<500 beds).	156 (80%)
Large (≥500 beds).	40 (20%)
<i>GIE Unit characteristics</i>	<i>No. of GI Units (%)</i>
Advanced techniques performed (ERCP and/or Echoendoscopy)	
Advanced unit	104 (53%)
Non advanced unit	92 (47%)
Provision of endoscopy training	
Yes	4 (22%)
No	152 (78%)

Validation of the questionnaire

After a review of the occupational risk prevention regulations in force in European Community, an occupational risk prevention technician (JMM) drafted a list of 50 ORP measures (validity of the content of the questionnaire).

The 50 measures were then individually assessed by five experienced endoscopists. They all graded each ORP measure subjectively in terms of their importance for worker safety, on a 4-point ordinal scale (not at all important, barely important, somewhat important and very important). The 32 highest scoring measures were drafted into a new list and used to design the final questionnaire (face validity of the questionnaire).

The questionnaire was answered individually by two endoscopy unit members at 20 randomly selected endoscopy units (from 15 public and 5 private hospitals). The correlation between the evaluators in each unit surpassed 95% (reliability of the questionnaire).

Distribution and collection of the questionnaire

The survey was distributed by members of the commercial network of a pharmaceutical company unrelated to endoscopy (Astra-Zeneca Spain). Up to three attempts were made to collect completed surveys, after which GIE units that had failed to provide the questionnaire were considered non-responders. The questionnaire was answered by the physicians responsible at each participating GIE unit (the Head of the Unit).

Evaluation of the results

The following Hospital or GIE Unit characteristics were evaluated: type of hospital (public or private according to

the Spanish National Health Service); number of hospital beds (small: <500 beds; large: ≥500 beds); the advanced diagnostic and therapeutic procedures performed (units performing endoscopic retrograde cholangiopancreatography –ERCP– and/or endoscopic ultrasound were considered advanced GIE units) and; provision of training (units that train endoscopists versus those that do not).

To determine how each factor affected the number of ORP measures applied, GIE units were subdivided into two groups: those that comply with 50% or more of the ORP measures and those that comply with less than 50%.

Statistics

All data were entered and assessed using the Statistical Package for the Social Sciences (SPSS version 14.0; SPSS Inc, Chicago, Ill., USA). Normality of data sets was determined with SPSS Explore and Descriptive functions. Data are expressed as the compliance rates for each ORP measure were estimated with a 95% confidence interval (1). Comparisons between proportions were performed with Chi-square. A logistic regression was used to estimate independent risk factors for compliance with less than 50% of the ORP measures. A p-value of <0.05 was considered statistically significant.

RESULTS

The questionnaire was answered by 197 of the 300 GIE units (65%). Respondent hospital characteristics are shown in table I. In the year prior to the survey, their GIE units had performed a combined total of 588,326 endoscopies (330,769 gastroscopies; 241,698 colonoscopies) and 15,859 ERCPs.

General measures for fire prevention

Table II shows general fire prevention measures at GIE units. No statistically significant difference was found in any of the factors analyzed under this heading. One hundred and two GIE units (52%; CI95%: 45-59) comply with less than 50% of the fire prevention measures.

Occupational risk prevention during disinfection

Measures for the prevention of occupational hazards during disinfection are displayed in table III. As shown, air extraction hoods and independent disinfection rooms are significantly more common at public facilities and at where training is provided. Masks and anti-slip floors are more common at private hospitals. One hundred and seven GIE units (54%; CI95%: 47-61) fulfilled fewer than 50% of the ORP measures studied.

Table II. General fire prevention measures

Prevention measures	Spanish GIE units	Spanish National Health Service		Hospital size		Advanced GIE units		Type of Hospital	
		Private hospitals	Public hospitals	Small	Large	Advanced	Non advanced	Teaching Hospital	Care Hospital
Evacuation Plan	97 (49%) (CI 95% 42-56)	51 (58%) (CI 95% 48-68)	46 (43%) (CI 95% 33-52)	77 (51%) (CI 95% 43-59)	77 (51%) (CI 95% 33-63)	51 (48%) (CI 95% 38-58)	46 (53%) (CI 95% 43-63)	22 (51%) (CI 95% 36-66)	75 (50%) (CI 95% 43-58)
Fire prevention plan	110 (56%) (CI95% 49-63)	55 (62%) (CI95% 52-72)	55 (52%) (CI95% 42-61)	84 (57%) (CI95% 49-65)	22 (51%) (CI95% 35-66)	59 (56%) (CI95% 46-66)	51 (57%) (CI95% 47-67)	24 (56%) (CI95% 41-71)	86 (57%) (CI95% 49-65)
Extinguishers	132 (67%) (CI95% 60-73)	69 (70%) (CI95% 60-79)	63 (61%) (CI95% 51-70)	105 (67%) (CI95% 60-74)	27 (68%) (CI95% 54-82)	76 (73%)* (CI95 64-82)	56 (64%) (CI95% 54-74)	31 (72%) (CI95% 59-85)	101 (67%) (CI95% 60-74)
Fire hoses	75 (38%) (CI95% 31-45)	36 (41%) (CI95% 31-51)	39 (37%) (CI95% 28-46)	59 (38%) (CI95% 30-56)	16 (37%) (CI95% 22-52)	41 (39%) (CI95% 30-48)	34 (38%) (CI95% 28-48)	21 (49%) (CI95% 34-64)	54 (37%) (CI95% 29-45)
Fire doors	74 (37%) (CI95% 30-44)	38 (43%) (CI95% 33-53)	36 (33%) (CI95% 24-41)	59 (36%) (CI95% 28-44)	15 (38%) (CI95% 23-53)	41 (39%) (CI95% 30-48)	33 (36%) (CI95% 26-46)	17 (40%) (CI95% 25-54)	57 (38%) (CI95% 30-46)
Smoke detectors	120 (61%) (CI95% 54-68)	66 (61%) (CI95% 51-71)	54 (64%) (CI95% 55-73)	94 (61%) (CI95% 53-69)	26 (65%) (CI95% 50-78)	67 (64%) (CI95% 55-73)	53 (60%) (CI95% 50-70)	28 (65%) (CI95% 51-79)	92 (62%) (CI95% 54-70)

An asterisk (*) indicates the cases where the difference is statistically significant -Chi square; $p < 0.05$ -. Data are expressed as the number of hospitals that fulfill each of the measures, the corresponding percentages and 95% confidence intervals (CI_{95%})

Occupational risk prevention measures during endoscopic procedure

Measures in place for risk prevention during examination are displayed in Table IV. As shown, the use of masks during endoscopy is significantly more common at private hospitals. Ninety-five GIE units (48%; CI95%: 41-55) fulfill less than 50% of the ORP measures studied.

Factors that influence the number of ORP measures applied in GIE units

Table V displays hospitals grouped according to the percentage of measures they comply with. As shown, it is significantly more common for private public hospitals to comply with at least 50% of the ORP measures than public hospitals.

Table III. Measures for the prevention of occupational hazards during disinfection

Prevention measures	Spanish GIE units	Spanish National Health Service		Hospital size		Advanced GIE units		Provision of endoscopy training	
		Private hospitals	Public hospitals	Small	Large	Advanced	Non advanced	Yes	No
Independent room	125 (63%) (CI 95% 56-70)	49 (56%) (CI 95% 46-66)	75 (70%)* (CI 95% 61-79)	95 (61%) (CI 95% 53-69)	30 (73%) (CI 95% 59-87)	68 (65%) (CI 95% 56-74)	56 (62%) (CI 95% 52-72)	35 (80%)* (CI 95% 68-92)	89 (59%) (CI 95% 51-67)
Anti-slip floors	52 (27%) (CI95% 21-33)	30 (36%)* (CI95% 26-46)	22 (21%) (CI95% 13-29)	38 (25%) (CI95% 18-32)	14 (35%) (CI95% 20-50)	25 (24%) (CI95% 16-32)	27 (30%) (CI95% 21-39)	13 (29%) (CI95% 16-42)	39 (26%) (CI95% 19-33)
Ventilation in the area									
Extractors use	64 (33%) (CI95% 26-40)	22 (25%) (CI95% 16-34)	42 (39%)* (CI95% 30-48)	51 (33%) (CI95% 26-40)	13 (33%) (CI95% 18-48)	37 (36%) (CI95% 27-45)	27 (29%) (CI95% 20-38)	20 (46%)* (CI95% 31-61)	44 (29%) (CI95% 22-36)
Protective gear									
Eyewear	38 (19%) (CI95% 14-24)	21 (24%) (CI95% 15-33)	17 (16%) (CI95% 9-23)	33 (21%) (CI95% 15-27)	5 (13%) (CI95% 3-23)	16 (15%) (CI95% 8-22)	22 (24%) (CI95% 15-33)	8 (18%) (CI95% 6-29)	31 (20%) (CI95% 14-26)
Gloves	195 (98%) (CI95% 96-99)	88 (100%) (CI95% 100-100)	107 (98%) (CI95% 95-100)	155 (98%) (CI95% 96-100)	40 (100%) (CI95% 100-100)	103 (98%) (CI95% 95-100)	91 (100%) (CI95% 100-100)	44 (100%) (CI95% 100-100)	151 (99%) (CI95% 97-100)
Masks	90 (46%) (CI95% 39-53)	51 (58%)* (CI95% 48-68)	39 (36%) (CI95% 27-45)	76 (49%) (CI95% 41-57)	14 (35%) (CI95% 20-50)	50 (48%) (CI95% 38-58)	40 (44%) (CI95% 34-54)	20 (46%) (CI95% 31-61)	70 (46%) (CI95% 38-54)
Aprons	42 (21%) (CI95% 15-27)	21 (24%) (CI95% 15-33)	21 (20%) (CI95% 12-28)	37 (24%) (CI95% 17-31)	5 (13%) (CI95% 3-23)	19 (18%) (CI95% 11-25)	23 (25%) (CI95% 16-34)	8 (18%) (CI95% 6-29)	34 (23%) (CI95% 16-30)
Disposable materials									
Biopsy forceps	63 (32%) (CI95% 25-39)	28 (32%) (CI95% 22-42)	35 (32%) (CI95% 23-41)	44 (28%) (CI95% 21-35)	19 (48%)* (CI95% 33-63)	39 (38%) (CI95% 29-47)	24 (26%) (CI95% 17-35)	22 (50%) (CI95% 35-65)	41 (27%)* (CI95% 20-34)
Sclerotherapy needles#	151 (77%) (CI95% 71-82)	62 (71%)* (CI95% 62-80)	89 (83%) (CI95% 76-90)	118 (76%) (CI95% 69-83)	33 (83%) (CI95% 72-95)	84 (81%) (CI95% 73-89)	67 (73%) (CI95% 64-82)	37 (84%) (CI95% 73-95)	114 (75%) (CI95% 68-82)

An asterisk (*) indicates the cases where the difference is statistically significant -Chi square; $p < 0.05$ -. # Only 156 GIE units use sclerotherapy needles. Data are expressed as the number of hospitals that fulfill each of the measures, the corresponding percentages and 95% confidence intervals (CI_{95%})

Table IV. Measures for the prevention of occupational hazards during examination

Prevention measures	Spanish GIE units	Spanish National Health Service		Hospital size		Advanced GIE units		Provision of endoscopy training	
		Private hospitals	Public hospitals	Small	Large	Advanced	Non advanced	Yes	No
Ventilation in the area									
Extractors use	33 (17 %) (CI95% 12-22)	19 (22 %) (CI95% 13-31)	14 (13 %) (CI95% 7-19)	25 (16 %) (CI95% 10-22)	8 (20 %) (CI95% 8-32)	15 (14 %) (CI95% 7-21)	18 (20 %) (CI95% 12-28)	8 (18 %) (CI95% 7-29)	25 (16 %) (CI95% 10-22)
Protective gear									
Eyewear	41 (21 %) (CI95% 15-27)	23 (26 %) (CI95% 17-35)	20 (19 %) (CI95% 12-26)	35 (22 %) (CI95% 15-29)	8 (20 %) (CI95% 8-32)	22 (21 %) (CI95% 13-29)	21 (23 %) (CI95% 14-32)	10 (23 %) (CI95% 11-35)	33 (22 %) (CI95% 15-29)
Gloves	195 (99 %) (CI95% 98-100)	88 (100 %) (CI95% 100-100)	107 (98 %) (CI95% 95-100)	155 (98 %) (CI95% 96-100)	40 (100 %) (CI95% 100-100)	104 (98 %) (CI95% 95-100)	91 (100 %) (CI95% 100-100)	44 (98 %) (CI95% 94-100)	151 (100 %) (CI95% 100-100)
Masks	89 (46 %) (CI95% 39-53)	50 (52 %)* (CI95% 41-62)	39 (36 %) (CI95% 27-45)	75 (48 %) (CI95% 40-56)	14 (35 %) (CI95% 20-50)	50 (48 %) (CI95% 38-58)	39 (43 %) (CI95% 33-53)	20 (46 %) (CI95% 31-61)	69 (46 %) (CI95% 38-54)
Aprons	38 (20 %) (CI95% 14-25)	18 (21 %) (CI95% 12-30)	20 (19 %) (CI95% 12-26)	33 (21 %) (CI95% 15-27)	5 (13 %) (CI95% 3-23)	19 (18 %) (CI95% 11-25)	19 (21 %) (CI95% 13-29)	8 (18 %) (CI95% 7-29)	30 (20 %) (CI95% 14-26)
Ergonomic measures									
Adjustable beds	88 (45 %) (CI95% 38-52)	33 (38 %) (CI95% 28-48)	55 (60 %) (CI95% 51-69)	65 (42 %) (CI95% 34-50)	23 (58 %) (CI95% 43-73)	51 (49 %) (CI95% 39-59)	37 (40 %) (CI95% 30-50)	26 (59 %)* (CI95% 44-74)	62 (41 %) (CI95% 33-48)
Auxiliary monitor	34 (17 %) (CI95% 12-22)	15 (17 %) (CI95% 9-25)	19 (18 %) (CI95% 11-25)	21 (14 %) (CI95% 8-19)	13 (33 %)* (CI95% 18-48)	20 (19 %) (CI95% 11-27)	14 (15 %) (CI95% 7-22)	12 (27 %)* (CI95% 14-40)	22 (15 %) (CI95% 9-21)

An asterisk (*) indicates the cases where the difference is statistically significant -Chi square; $p < 0.05$ -. Data are expressed as the number of hospitals that fulfill each of the measures, the corresponding percentages and 95% confidence intervals (CI_{95%})

Logistic regression showed that belonging or not to the Spanish National Health Service was the only individual factor that had a significant impact on the number of ORP measures that gastrointestinal endoscopy units complied with. The RR of less than 50% of the ORP measures being fulfilled is 1.975 times higher at public hospitals than at private facilities (CI95%: 1.11-3.52).

DISCUSSION

Our research divided the assessment of ORP implementation at Spanish GIE units in three specific areas: fire prevention measures, ORP during disinfection and finally ORP during examination

In the area of general fire prevention measures, 51% of GIE units declare that they do not have a fire prevention plan and the 41% said do not have evacuation plan. We believe this figure is due more to unawareness on behalf of GIE unit staff regarding hospital evacuation

and fire prevention plans rather than an actual lack of such plans, as hospitals are legally compelled to develop and implement these plans. However, if hospital workers are unaware of them, the usefulness of such plans is highly questionable. In view of our results, we believe that hospital managements must act urgently to increase employee awareness regarding general prevention measures.

We found the situation to be similar regarding GIE unit fire equipment. Thirty-three percent (33%) lack fire extinguishers, 62% lack adequately equipped fire hydrants (with fire hoses), 63% do not have fire doors and 39% lack smoke detectors. Notwithstanding, perhaps most striking of all is the fact that 40 GIE units, or 20% of all responders, stated that they do not have any of these fire protection measures.

Regardless of whether these measures are truly lacking or GIE staff is simply unaware of them, our results reveal the inadequacy of fire prevention measures at Spanish GIE units.

Table V. Hospitals that fulfill over or less than 50% of the ORP measures studied

Prevention measures	GIE units	Spanish National Health Service		Hospital size		Advanced GIE units		Provision of endoscopy training	
		Private hospitals	Public hospitals	Small	Large	Advanced	Non advanced	Yes	No
>50% de las medidas de PRL	92 (47%) (CI 95% 40-54)	51 (58%)* (CI 95% 48-68)	41 (38%) (CI 95% 29-47)	73 (47%) (CI 95% 39-55)	19 (48%) (CI 95% 33-63)	51 (49%) (CI 95% 39-59)	41 (45%) (CI 95% 35-45)	24 (55%) (CI 95% 40-70)	68 (45%) (CI 95% 37-53)
<50% de las medidas de PRL	104 (53 %) (CI95% 46-60)	37 (42 %) (CI95% 35-49)	67 (62 %) (CI95% 53-71)	83 (53 %) (CI95% 45-61)	21 (52 %) (CI95% 47-77)	53 (51 %) (CI95% 41-61)	51 (55 %) (CI95% 45-65)	20 (45 %) (CI95% 30-60)	84 (55 %) (CI95% 47-63)

An asterisk (*) indicates the cases where the difference is statistically significant -Chi square; $p < 0.05$ -. Data are expressed as the number of hospitals that fulfill each of the measures, the corresponding percentages and 95% confidence intervals (CI_{95%})

The cleaning and disinfection of endoscopes is one of the most critical moments in GIE units as regards the risk of accidents. These tasks should be performed in a suitable environment, preferably separate from examination areas, and with adequate ORP measures (2). Measures should include anti-slip floors to prevent falls (2) and good air extraction systems to prevent the risk of intoxication caused by the gases released by disinfectants (3-6). 37% of GIE units disinfect endoscopes in the actual procedure room, 73% lack anti-slip floors in the cleaning and disinfection area and 91% lack extractor hoods above disinfection surfaces.

Another important issue in accident prevention during instrument disinfection is the use of protective equipment, which should include eyewear, gloves, masks and aprons (2, 7-9). However, gloves aside, assistant staff at between 50% and 80% of GIE units does not use the adequate protective measures during these procedures. Eyewear, masks or aprons can admittedly be uncomfortable items, but nevertheless they are essential to avoid accidents.

The use of disposable materials was another of the aspects covered in the section regarding ORP during disinfection. During their use, auxiliary endoscopy instruments come into contact with patients' blood and are therefore considered to be among the group of "critical items" (6-9). The disassembly of these items for cleaning and disinfection entails a high risk of accidents. These risks can be avoided by using disposable materials (6). Among these items, sclerotherapy needles pose the greatest risk of all. The fact that only 3% of GIE units still use reusable sclerotherapy needles can be considered a positive sign. However, 80% of GIE units use reusable forceps and 43% use reusable ERCP materials.

Our data lead us to conclude that the ORP measures in place during disinfection procedures at Spanish GIE units are clearly insufficient and should be reviewed and improved without further delay.

The third aspect assessed by the survey addressed ORP measures taken during examinations. Units were questioned regarding the aeration of examination areas, protective measures for staff performing examinations and ergonomic measures in place in examination rooms (2, 7, 11).

At 36% of the GIE units, examination areas are usually aerated by means of windows, while 58% use ventilation systems (air conditioning and/or extraction systems). Six percent of responders did not answer this question.

The situation regarding the use of protective gear during endoscopy is comparable to that of disinfection. The use of gloves is almost universal, although two units stated that they did not use them. On the other hand, the use of other items (protective eyewear, masks and aprons) is in the range of 20% to 45%. As with disinfection, even though these items can be uncomfortable to wear during endoscopy, their use is essential in order to prevent hazards (7-9).

Only two of the survey questions addressed ergonomic measures during examination: the use of height-adjustable beds and of auxiliary monitors. Adjustable beds make patient handling easier, thus helping to prevent back injuries. The same can be said of auxiliary monitors: during examinations, particularly in the case of colonoscopies, the endoscopist is forced to adopt "awkward positions" when bending the endoscope in order to keep the monitor in view, but this can be avoided with the use of secondary monitors. Despite their usefulness, just 45% of respondent GIE units have hydraulic adjustable beds and only 17% have auxiliary monitors.

There are other ergonomic aspects that our research did not address, such as room size, monitor height, endoscopy tower mobility, use of swing arms etc. Likewise, it would be useful to assess other features, such as the shape and size of endoscope control pads or the handles on auxiliary instruments (forceps, grips, etc...).

Even though prior research has found certain deficiencies in our setting (12), to our knowledge this is the first survey in the literature to assess GIE unit compliance with a series of ORP measures.

The only factor among those studied that was found to have a significant impact on the number of ORP measures implemented in gastrointestinal endoscopy units was whether or not the facility belonged to the Spanish National Health Service. The RR of less than 50% of the ORP measures being fulfilled is 1.975 times higher at public hospitals than at private facilities (CI95%: 1.11-3.52). This is an important issue, as the majority of healthcare provided in Spain is done so publicly. Most Spanish National Health Service hospitals are more than 30 years old and are not properly adapted to current occupational risk prevention legislation. An extensive modernization program currently under way is expected to rectify this situation.

In order to simplify data collection and increase response rates, we chose to conduct a convenience survey. In other words, surveys were distributed and collected through the nationwide commercial network of a pharmaceutical company. We are aware that this type of survey can introduce biases and thus restrict the validity of results. In exchange however, the choice of survey (13) allowed a high response rate (65% of GIE units), providing a good sample of different types of hospital across every region in Spain. This leads us to believe that the information collected adequately reflects the degree of fulfillment of ORP measures at Spanish GIE units.

To conclude, we believe that ORP is not yet a part of the organizational culture of Spanish GIE units. If endoscopists are to avoid complications, they must gradually increase their awareness regarding the importance of these measures. Complications may take years to surface, but there can be no doubt as to the threat they pose on our future health and quality of life. Our research covers only some of the aspects of ORP in GIE units and we, the community of endoscopists, must learn more about these measures and demand their enforcement.

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