

RESEARCH ARTICLE

Development, validation and evaluation of learning activities to support the reporting of adverse drug reactions during the COVID-19 pandemic

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Abstract

Background: The fast tracking of the production of COVID-19 vaccines gave rise to aspects of general concern regarding their safety. The vigilance aspect of adverse drug reaction (ADR) reporting is a means to build up the science behind the safety aspects. The aim was to develop, validate and apply learning activities for healthcare professionals (HCPs) to educate and support them on ADR reporting. **Methods:** Two educational webinars were developed, validated, applied and evaluated by pharmacists, medical doctors, dentists and nurses. **Results:** Evaluation forms about the webinars were completed by 103 out of 132 HCPs (first webinar), and 73 out of 90 HCPs (second webinar). **Conclusion:** HCPs agreed that the educational webinars made them more aware of the importance of ADR reporting and the webinars helped them overcome barriers to ADR reporting.

Introduction

In cases where the production of medicinal products or vaccines is fast-tracked, spontaneous reporting plays a crucial role in providing scientific evidence of safety. The importance of and need for adverse drug reaction (ADR) reporting is seen in the case of the newly-developed COVID-19 vaccines. The COVID-19 pandemic brought about the need for fast development and approval of vaccines (Shakir *et al.*, 2021). The rapid process of developing COVID-19 vaccines resulted in a general concern among healthcare professionals (HCPs) and the public regarding the safety of the vaccines. HCPs and the public felt that important steps for the assessment of the safety of newly developed vaccines were skipped (Petousis-Harris, 2020). Encouraging spontaneous reporting can help increase available data on newly marketed medicinal products, thus increasing the confidence of HCPs and the public in the use of such products.

ADRs, especially the ones with low frequency, may emerge with widespread real-world use of medicinal

products (European Medicines Agency, 2021a). When new medicinal products get marketing authorisation, they are used on a larger population, for a longer period of time and, in some cases, in concomitance with other medicinal products. Prior to marketing authorisation, information about safety and efficacy of newly developed medicinal products is limited to results from animal testing and clinical trials (Borg *et al.*, 2011).

Limited data on the safety and efficacy of newly developed medicinal products and vaccines underline the need for post-marketing surveillance (Borg *et al.*, 2011). The process of continuous monitoring for safety concerns is a core objective of pharmacovigilance (PhV) which plays an important role in safeguarding patient safety and the appropriate use of medicines (Santoro *et al.*, 2017; Borg *et al.*, 2018). The Spontaneous Reporting System is the main system for identifying previously undetected, uncommon or unexpected ADRs (Ali *et al.*, 2018) and for continuously assessing the risk-benefit balance of some drugs (Hailu & Mohammed, 2020). With spontaneous reporting systems, suspected ADRs are reported voluntarily by HCPs, manufacturers and

patients. ADR reporting by HCPs and patients is critical to the success of post-marketing surveillance (Borg *et al.*, 2018).

Spontaneous reporting systems present some limitations, which are primarily associated with underreporting, variable quality of information reported and lack of evidence on drug exposure (Palleria *et al.*, 2013). Underreporting might introduce bias due to selective reporting of ADRs, reducing the impact of ADR reporting (Biagi *et al.*, 2013). One to 10% of serious ADRs are reported (Klika *et al.*, 2017) and there is no difference between reporting rates in the community and in the hospital setting (Hailu & Mohammed, 2020).

Previous studies showed that the main barriers to HCPs not reporting an ADR were: lack of knowledge (Venkatasubbaiah *et al.*, 2021), negative attitudes, indifference, lack of motivation, misconceptions, difficulty in accessing the ADR reporting form (Lopez-Gonzalez *et al.*, 2009), fear that the report might be incorrect (AlShammari & Almoslem, 2018) and lack of training and understanding of protocols related to ADR reporting (Al Rabayah *et al.*, 2019).

Educational interventions about ADR reporting help improve the amount and quality of ADR reports (Lopez-Gonzalez *et al.*, 2015; Ganesan *et al.*, 2017; Nisa *et al.*, 2018, Cheema *et al.*, 2019). A study by Figueirais and colleagues revealed that the number of ADR reports increased by 148% following educational interventions (Figueiras *et al.*, 2006). In a study by Ganesan and colleagues, the number of ADR reports doubled following an educational intervention (Ganesan *et al.*, 2017).

Studies have shown that educational interventions, such as didactic lectures (Primo & Capucho, 2011; Opadeyi *et al.*, 2019); monthly SMS reminders (Opadeyi *et al.*, 2019); workshops (Primo & Capucho, 2011; Ribeiro-Vaz *et al.*, 2011; Herdeiro *et al.*, 2012; Lopez-Gonzalez *et al.*, 2015); telephone interviews (Ribeiro-Vaz *et al.*, 2011; Herdeiro *et al.*, 2012); distribution of educational material (Herdeiro *et al.*, 2008; Pedrós *et al.*, 2009; Cereza *et al.*, 2010; Johansson *et al.*, 2011; Primo and Capucho, 2011; Ribeiro-Vaz *et al.*, 2011; Herdeiro *et al.*, 2012; Lopez-Gonzalez *et al.*, 2015); dissemination of emails (Johansson *et al.*, 2009; Biagi *et al.*, 2013); educational outreach visits (Figueiras *et al.*, 2006; Gony *et al.*, 2010) and periodic educational meetings (Pedrós *et al.*, 2009; Cereza *et al.*, 2010) help improve the knowledge, attitude and practice of HCPs towards ADR reporting and ultimately improve the number and quality of ADR reports.

The aim was to develop, validate, apply and evaluate learning activities for HCPs to educate and support

them on ADR reporting, with a particular focus on the COVID-19 vaccine.

Methods

After obtaining approval from the Faculty Research Ethics Committee of the University of Malta, two educational webinars were developed, validated and delivered to pharmacists, medical doctors, nurses and dentists. The aim of the two webinars was to educate and support HCPs on ADR reporting, thus increasing the amount and quality of ADR reports and ultimately contributing to the safety of the COVID-19 vaccines. The educational webinars were evaluated using an evaluation form.

Development of educational webinars

Three focus groups consisting of HCPs from three different healthcare settings to discuss information to be included in the educational webinars were organised and conducted by the researcher. The healthcare professionals participating in the focus groups were recruited by convenience sampling. The first focus group included HCPs from a clinical setting and included one medical doctor, one pharmacist and one nurse. The second focus group included three pharmacists from academia and the third focus group included three pharmacists from the regulatory setting.

Two educational webinars within the theme of “*Pharmacovigilance in the time of a pandemic crisis: Adverse Drug Reaction reporting*” were developed using Microsoft PowerPoint. The duration of each educational webinar was one hour.

Validation of educational webinars

The two educational webinars were validated by a panel of seven professionals: four pharmacists (two pharmacists in academia, two pharmacists practising in regulatory affairs), two nurses (two senior nursing managers at a rehabilitation hospital) and one medical doctor (a higher specialist trainee in geriatrics). The healthcare professionals from the validation panel were asked to comment on and validate the two educational webinars during individual online interviews. The educational webinars were updated according to the suggested amendments by the panel.

Application of two educational webinars

An invitation to attend the two educational webinars was sent online to: pharmacists via their registration council (N=1242), to nurses and midwives working

within the public sector (N=3358), to dentists through the Dental Association (N=207) and medical doctors who are members of the Malta College of Family Doctors (N=297).

The two educational webinars approved by the validation panel were delivered via two live online webinars through the Zoom platform, one on the 22nd of February 2021 (N=132 participants) and the second one on the 15 March 2021 (N=90 participants).

The two educational webinars were recorded and a link to the recording was sent to all the HCPs who participated in the webinars via Zoom.

Development of the evaluation form

The questions to be included in the evaluation form were identified during the focus group discussions. An evaluation form was developed using Google Forms. The evaluation form was anonymous and was divided into two sections: participants' demographics and evaluation of the educational webinar. In the demographics section, information regarding gender, age, profession, area and years of practice were included. The section regarding the evaluation of the educational webinar was divided into three subsections. Participants were required to rate, on a Likert scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) to 5 (strongly agree), i. Their agreement to statements regarding the educational content of the webinar, ii. The relevance for their practice, and iii. Whether the educational webinar met their expectations. At the end of the section, a question for additional comments, feedback and suggestions was included.

Validation of evaluation form

The evaluation form was validated by the same panel of seven healthcare professionals who validated the two educational webinars. To validate the evaluation form, the members of the panel were asked to rate each question for relevance and clarity on a Likert scale of 1 to 5 (5 being the highest) using a validation tool. For each question, the members of the panel were asked to include comments in the appropriate section. The evaluation form was modified according to the suggested amendments by the panel.

Application of the evaluation form

The anonymous evaluation form was disseminated to pharmacists, medical doctors, dentists and nurses who attended the two educational webinars.

Results

The topics chosen to be covered in the first educational webinar included: i) Background on ADRs, ii) The ADR reporting system, and iii) Case studies on the first COVID-19 vaccine available in Malta at the time of the first webinar. The topics covered in the second educational webinar included: i) COVID-19 vaccination - current situation, ii) Case studies on the three COVID-19 vaccines available in Malta at the time of the second webinar, iii) Outcomes of ADR reports and iv) Recognising ADRs in practice (Table I).

Table I: Topics discussed during the two educational webinars

First educational webinar			Second educational webinar			
Background	ADR reporting system	Case studies	Covid-19 vaccination-current situation	Case studies	Outcomes of ADR reports	Recognising ADRs in practice
Importance of recognising ADRs	European ADR reporting system	COVID-19 vaccine	ADR reports in Malta for	COVID-19 vaccine	Processing of ADR reports by the Maltese regulatory agency	How to recognise an ADR
Definition of serious ADRs	Maltese ADR reporting form	Comirnaty (Pfizer-BioNTech)	Comirnaty (Pfizer-BioNTech), Vaxzevria (Astrazeneca), Spikevax (Moderna) COVID-19 vaccines	Comirnaty (Pfizer-BioNTech)	Safety Circulars, Risk Management Measures, Direct Healthcare Professional Communications with examples	Outpatient and Inpatient examples
Underreporting of ADRs	Where to find the ADR reporting form, what to report, how to fill it in, where to send it			COVID-19 vaccine Vaxzevria (Astrazeneca)		The Safety Representative: roles and tools
Barriers to HCPs toward ADR reporting				COVID-19 vaccine Spikevax (Moderna)		
The importance of ADR reporting and PhV						
Spontaneous reporting of COVID-19 vaccination ADRs in Malta						

After the first educational webinar, the evaluation form was completed by 103 participants and after the second educational webinar the evaluation form was completed by 73 participants. Participants of the first educational webinar included; 63 pharmacists (female n=42; male n=21), 14 medical doctors (female n=12; male n=2), 6 dentists (female n=2; male n=4) and 20 nurses (female n=17; male n=3). The mean age in years for pharmacists was 36, for medical doctors 45, for dentists 54 and for nurses 49. The mean years of practice for pharmacists were 12 years, for medical doctors 19 years, for dentists 28 years and for nurses 21 years. Participants of the second educational webinar included; 39 pharmacists (female n=23; male n=16), 17 medical doctors (female n=10; male n=7), and 17 nurses (female n=13; male n=4). The mean age in years for pharmacists was 36, for medical doctors 54 and for nurses 46. The mean years of practice for pharmacists were 13 years, for medical doctors 27 years and for nurses 20 years. Most pharmacists who completed the evaluation form after the first educational webinar practiced in community pharmacy (n=28). The majority of nurses (n=17) and medical doctors (n=5) practiced in hospital. Most dentists practiced in academia (n=3). In the second response group, most pharmacists who completed the evaluation form practiced in the regulatory setting (n=19) unlike the pharmacist cohort who replied in the first webinar evaluation. For the medical doctors and nurses, the main area of practice was in hospitals or clinics.

Medical doctors and nurses who attended the first educational webinar agreed with a significantly higher mean rating score that the information in the educational webinar was comprehensive (Table II). Medical doctors who attended the first educational webinar significantly agreed more than the other groups of professionals that the webinar was relevant for their practice (Table II). For both webinars, nurses agreed with a significantly higher mean rating score that the educational webinars made them more aware of the importance of ADR reporting and that the webinars helped them to overcome barriers toward ADR reporting (Table II and Table III). Pharmacists and medical doctors who attended the two educational webinars agreed with a significantly higher mean rating score that following the webinars they were more confident with ADR reporting (Table II and Table III). Medical doctors who participated in the first educational webinar significantly agreed more than pharmacists, dentists and nurses that the webinar met their expectations (Table II).

It emerged from the comments that: 1) Nurses are not aware enough of the importance of ADR reporting and they suggested that PhV topics should be included in undergraduate curricula; 2) HCPs would like to receive regular updates on PhV, ADR reporting and medication errors; 3) HCPs suggested that educational webinars should become part of continuous professional development to enhance their practice as front-liners as well as to renew their warrant.

Table II: Evaluation of the first educational webinar (N=103)

Statement	Profession	Mean \pm SD	p-value
The sequence of material was appropriate	Pharmacist (n=63)	4.68 \pm 0.47	0.111
	Medical Doctor (n=14)	4.71 \pm 0.47	
	Dentist (n=6)	4.33 \pm 0.51	
	Nurse (n=20)	4.85 \pm 0.37	
Information in the educational webinar was clearly presented	Pharmacist (n=63)	4.76 \pm 0.43	0.168
	Medical Doctor (n=14)	4.86 \pm 0.36	
	Dentist (n=6)	4.50 \pm 0.55	
	Nurse (n=20)	4.90 \pm 0.30	
Information in the educational webinar was comprehensive	Pharmacist (n=63)	4.67 \pm 0.54	0.003 [†]
	Medical Doctor (n=14)	4.86 \pm 0.36	
	Dentist (n=6)	3.50 \pm 1.50	
	Nurse (n=20)	4.95 \pm 0.22	
The educational webinar was relevant to my practice	Pharmacist (n=63)	4.56 \pm 0.64	0.014 [†]
	Medical Doctor (n=14)	4.71 \pm 0.47	
	Dentist (n=6)	3.50 \pm 0.83	
	Nurse (n=20)	4.60 \pm 0.60	
The educational webinar made me more aware of the importance of ADR reporting	Pharmacist (n=63)	4.40 \pm 0.77	0.039 [†]
	Medical Doctor (n=14)	4.64 \pm 0.74	
	Dentist (n=6)	4.33 \pm 0.81	
	Nurse (n=20)	4.85 \pm 0.50	
The educational webinar helped me overcome barriers to ADR reporting	Pharmacist (n=63)	4.24 \pm 0.83	0.047 [†]
	Medical Doctor (n=14)	4.07 \pm 0.82	
	Dentist (n=6)	3.83 \pm 1.16	
	Nurse (n=20)	4.70 \pm 0.57	

Statement	Profession	Mean [‡] ± SD	p-value
Following the educational webinar, I am confident with ADR reporting	Pharmacist (n=63)	4.38±0.70	0.036 [†]
	Medical Doctor (n=14)	4.50±0.52	
	Dentist (n=6)	3.83±0.75	
	Nurse (n=20)	4.00±0.47	
The educational webinar met my expectations	Pharmacist (n=63)	4.37±0.84	0.039 [†]
	Medical Doctor (n=14)	4.71±0.47	
	Dentist (n=6)	3.33±1.30	
	Nurse (n=20)	4.40±0.84	

[†]statistically significant results $p < 0.05$; [‡]Range of rating scale 1 to 5, (5 being the highest)

Table III: Evaluation of the second educational webinar (N=73)

Statement	Profession	Mean [‡] ± SD	p-value
The sequence of material was appropriate	Pharmacist (n=39)	4.62±0.49	0.962
	Medical Doctor (n=17)	4.65±0.49	
	Nurse (n=17)	4.65±0.49	
Information in the educational webinar was clearly presented	Pharmacist (n=39)	4.67±0.53	0.547
	Medical Doctor (n=17)	4.82±0.39	
	Nurse (n=17)	4.76±0.44	
Information in the educational webinar was comprehensive	Pharmacist (n=39)	4.67±0.48	0.959
	Medical Doctor (n=17)	4.71±0.47	
	Nurse (n=17)	4.65±0.60	
The educational webinar was relevant for my practice	Pharmacist (n=39)	4.31±0.89	0.598
	Medical Doctor (n=17)	4.59±0.62	
	Nurse (n=17)	4.47±0.72	
The educational webinar made me more aware of the importance of ADR reporting	Pharmacist (n=39)	4.13±0.95	0.031 [†]
	Medical Doctor (n=17)	4.59±0.79	
	Nurse (n=17)	4.71±0.47	
The educational webinar helped me overcome barriers to ADR reporting	Pharmacist (n=39)	4.18±0.88	0.031 [†]
	Medical Doctor (n=17)	4.47±0.80	
	Nurse (n=17)	4.76±0.44	
Following the educational webinar, I am confident with ADR reporting	Pharmacist (n=39)	4.31±0.73	0.044 [†]
	Medical Doctor (n=17)	4.53±0.51	
	Nurse (n=17)	3.94±0.66	
The educational webinar met my expectations	Pharmacist (n=39)	4.49±0.64	0.471
	Medical Doctor (n=17)	4.71±0.47	
	Nurse (n=17)	4.65±0.49	

[†]statistically significant results $p < 0.05$; [‡]Range of rating scale 1 to 5 (5 being the highest)

Discussion

Education and training increases the awareness of HCPs about the importance of ADR reporting (Al Rabayah *et al.*, 2019), and overcome barriers (Biagi *et al.*, 2013; Lemay *et al.*, 2018; Cheema *et al.*, 2019; Salehi *et al.*, 2021). Two educational webinars were organised to help increase the awareness of HCPs about the importance of ADR reporting, especially when it comes to the newly marketed COVID-19 vaccines.

The case studies chosen for the discussion were all related to COVID-19 vaccines, which were available on the Maltese market at the time of the educational webinars: Comirnaty (Pfizer-BioNTech), Vaxzevria (Astrazeneca), Spikevax (Moderna). Case studies related to COVID-19 vaccines were chosen to apply to the current situation where concerns on the safety of newly developed COVID-19 vaccines were present. Safety concerns related to the newly developed COVID-

19 vaccines brought about the need to support and educate HCPs on how to correctly report ADRs. Supporting and educating HCPs on ADR reporting was considered essential to increase the quality and quantity of ADR reports and, ultimately, to contribute to a better and more widely known safety profile of the newly developed COVID-19 vaccines. The case study discussed during the first educational webinar included a serious ADR experienced by a Maltese patient after taking Comirnaty (Pfizer-BioNTech) vaccine. The other case studies included in the second educational webinar showed other serious ADRs developed by patients after taking the three vaccines marketed in Malta at that time and were taken from Eudravigilance (European Medicines Agency, 2021b).

HCPs were not asked to attend both educational webinars, as both educational webinars provided guidelines on how ADR reporting should be undertaken. Attending both of the educational

webinars could have helped the HCPs attain a better understanding on correct ADR reporting and the importance of it. It was not investigated whether the HCPs had already reported an ADR prior to the training. HCPs who participated in the educational webinars were not asked to state whether they had ever reported an ADR.

Medical doctors and nurses are involved in the administration of COVID-19 vaccines and nurses stated that they were more aware of the importance of ADR reporting following the educational webinars. Other studies reported increased awareness and confidence regarding ADR reporting following educational programmes (Jha, 2014; Ganesan *et al.*, 2017; Varallo *et al.*, 2017; Shutte *et al.*, 2018; Opadeyi *et al.*, 2019; Shrestha *et al.*, 2020). Pharmacists and medical doctors who were more self-confident on ADR reporting following the educational webinars explained that they could have already acquired the knowledge on the subject.

Participation and response rates of dentists in this study was the lowest compared to the other professions. The number of dentists practicing in Malta is small and not all of them could be contacted to invite them to attend the seminar.

Varallo and colleagues revealed that the number of ADR reports decreased after four months following an educational intervention (Varallo *et al.*, 2017). A decrease in the number of ADR reports following an educational intervention is also seen in another study (Lopez-Gonzalez, 2015). Varallo and colleagues suggested that educational interventions should be held periodically to maintain motivation among HCPs when it comes to ADR reporting (Varallo *et al.*, 2017). From the comments on the evaluation forms, it emerged that HCPs would like to receive regular updates on PhV topics, and they would like to become part of continuous professional development. This study suggests that regular educational activities should be carried out.

Educational webinars, such as the ones conducted in this study, helped increase awareness of HCPs on the importance of quality ADR reporting. Higher awareness among HCPs about ADR reporting can lead not only to an increase in confidence while reporting an ADR, but also an increase in the number of ADR reports and increased data on safety, which can ultimately help to improve a patient's quality of life.

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