UNIVERSITÀ DEGLI STUDI DI MILANO

SCUOLA DI DOTTORATO IN SCIENZE BIOMEDICHE CLINICHE E SPERIMENTALI

DOTTORATO DI RICERCA IN SANITA' PUBBLICA

XXVI CICLO

TESI DI DOTTORATO DI RICERCA

One Communication and One Health:
communication in Veterinary Medicine to improve human health

DOTTORANDO Dott.ssa Micaela Cipolla

RELATORE Prof.ssa Mirella Pontello

CORRELATORE Prof. Luigi Bonizzi

COORDINATORE DEL DOTTORATO Prof. Alessandro Zanetti

A.A. 2012-2013

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DOCTORAL THESIS IN PUBLIC HEALTH

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AUTHOR Dr. Micaela Cipolla

SUPERVISOR Prof. Mirella Pontello

CO-SUPERVISOR Prof. Luigi Bonizzi

COORDINATORE DEL DOTTORATO Prof. Alessandro Zanetti

Academic Year 2012-2013

GLOSSARY

AMA	American Medical Association
AMR	Antimicrobial Resistance
AVMA	American Veterinary Medical Association
ASL	Local health authority (Azienda Sanitaria Locale)
BBN	Breaking Bad News
BTM SCC	Bulk Milk Somatic Cell Count
BVD	Bovine Virus Diarrhea
CDC	Centers for Diseases Control and Prevention
DIVET	Dept. of Veterinary Science and Public Health, Università degli Studi di Milano
ECDC	European Center for Diseases Prevention and Control
E. coli STEC	Shiga toxin-producing Escherichia coli
FAO	Food and Agriculture Organization of the United Nations
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
IAEA	International Atomic Energy Agency
IBR	Infectious Bovine Rhinotracheitis
IZLER	Regional Diagnostic Lab (Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna)
OIE	World Organization for Animal Health
PRPV	Regional veterinary prevention plan (Piano Regionale di Prevenzione Veterinaria)
SARS	Severe Acute Respiratory Syndrome
Staphyloccus aureus MRSA	Methicillin-resistant Staphylococcus aureus

UNICEF	United Nations Children's Fund
UNEP	United Nations Environment Programme
WHO	World Health Organization

ABSTRACT

Health communication has become recently an essential and powerful tool for public health. Its role has been largely recognized in human medicine, but it has been less considered in veterinary medicine even if this latter field is not less decisive for the human health. The One Health concept unified the two medicines recognizing that human health is inextricably connected to animal health and environment.

Within this framework, we design this study to investigate the relationship between health communication and One Health. Particularly, we focused on the role of communication in veterinary medicine and how it has the potential to improve human health.

Veterinary medicine competences include a broad spectrum of aspects, which can't be covered in a single study. Moreover, we were interested in investigate if communication has a role also in the veterinary areas traditionally considered less linked to public health. Therefore, this study was focused on clinical communication, both in companion and in food-producing animals practice.

This study confirmed the outcomes from previous surveys and showed the importance of communication in veterinary medicine in improving human health.

Communication in veterinary medicine is not less important for human health, and is not different from what is usually considered health communication. Indeed, both of them cover the same issue (zoonoses, food safety etc.) and use the same strategies.

Therefore, a "One Communication" approach appear to be the most helpful tool in improving human health in the One World-One Health-One Medicine.

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1. INTRODUCTION

Health communication has become recently an essential and powerful tool for public health. Its role has been largely recognized in human medicine, but it has been less considered in veterinary medicine even if this latter field is not less decisive for the human health. Indeed, public health is the final objective of veterinary medicine, which improves and protects it via enhancing animal health and food safety. The One Health concept unified the two medicines recognizing that human health is inextricably connected to animal health and environment.

Within this framework, we design this study to investigate the relationship between health communication and One Health. Particularly, we focused on the role of health communication in veterinary medicine and how communication in this field has the potential to improve human health.

1.1 Health Communication

Health Communication is a relatively recent matter and it is defined as:

> *The study of how health information is generated and disseminated and how that information affects individuals, community groups, institutions and public policy. The field includes the study of secular communication, as well as the strategic communication of evidence-based health information to professional and non-professional audiences [1]*

The Centers for Diseases Control and Prevention (CDC) and the National Cancer Institute defined it as:

> *The study and use of communication strategies to inform and influence individual decisions that enhance health [2]*

Indeed, the aim of health communication is to change people's behavior and attitude in order to improve health[3]. This is possible because it concerns all aspects of health, including i.e. research, clinical practice, public health, global health and policy making[4].

Therefore, to cover all the health fields, several and different approaches are available such as:

- Patient-provider communication
- Risk communication
- Health campaigns
- eHealth
- Health literacy

An effective communication is essential to public health, it can be written and verbal, can take many forms and can use various channels (physicians and other health professionals, family, friends, mass-media, Internet, advertisement). For its growing importance, it was allocated a chapter in the United States of America (USA)'s Healthy People 2010 objectives.[5]

World Health Organization (WHO) include health communication in its activities and provides several guides supporting communication strategies development for different situations, such as health emergencies and disease prevention (i.e. HPV, Dengue fever, Hepatitis B)[6-12]. Several communication experience involving WHO, United Nations Children's Fund (UNICEF), PATH and Johns Hopkins Bloomberg School of Public Health are specifically focused on vaccination plans[13-17]. Moreover, the most important international organizations such as WHO, UNICEF and Food and Agriculture Organization of the United Nations (FAO) considered the role of communication during an outbreak[18]. In order to make healthier the life of world population, WHO adopt four different communication strategies: outrage management, health education, precautionary advocacy and crisis communication[19]. Considering health education, strategies for designing programs, tailoring information on the audience, were implemented also by Johns Hopkins Bloomberg School of Public Health / Center for Communication Programs, U.S. Department of Health and Human Services, and UK Department for International Development[20-22].

Moreover, health communication is considered a key issue by CDC[23] and by U.S. Department of Health and Human Services[24]. Even many pharmaceutical companies designed programs on health communication topics[25].

This wide interest is due to the fact that every advice aiming to change people's behavior and to enhance health is a communicative act. Health communication is the tool allowing to study it, identifying contexts, channels, messages and factors having the potential to motivate individuals to use correctly health information. Studying health communication means knowing how to persuade the population to do the right thing and to forecast how people react. It allows to define predictors

of people response in many situations related to health, theorizing also about risk perception, emotions and uncertainty in responses.

Therefore, health communication supports health professionals in their daily work, educates patients and helps policy makers; it has a powerful role in disease prevention and health promotion. For example, WHO demonstrated a significant reduction of cases during an infectious disease outbreak when applied proactive communication[26]. However, many health authorities are hardly inclined to use and verify the value of communication in public health[27].

Due to its pivotal importance, health communication became part of the curriculum in Medicine and Veterinary Medicine Schools worldwide. However, in Italy this field of study is still poorly considered in Medicine, and in Veterinary Medicine is not considered at all.

1.2 One Health

"One medicine" is a term coined by Calvin Schwabe[28], known as one of the fathers of modern epidemiology, and is considered a synonym of the two more recent wording "One Health" and "One World, One Health, One Medicine". All these three expressions are referred to the same concept, that links human, animal and environmental health:

> *"The One Health concept is a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. The synergism achieved will advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care. When properly implemented, it will help protect and save untold millions of lives in our present and future generations".[29]*

This approach considers all global health threats to gain a cross-disciplinary collaboration and communication. The result is a collaborative effort to enhance human and animal health between the health professions, especially physicians and veterinarians.

The historic cooperation between the American Medical Association (AMA) and the American Veterinary Medical Association (AVMA) was a crucial step of this process.[30] The utility of the One Health approach, and of this kind of medical cooperation, is not only theoretical but also practical. For example, the use of human and animal sentinel for health hazards is very helpful to detect and manage more quickly and efficiently shared health risks. [31] Also when considering toxic risk, as shown by the potentials of "One Toxicology", the protection of domestic and wild animals' health is functional to the defense of the human one[32]. Particularly, companion animals have an important

role in cancer prevention and treatment in humans, because often they share the same risk and carcinogen factors, have many of the same types of cancer and are treated almost with the same drugs of humans[33]. Moreover, the veterinary diseases surveillance networks have a key role also in human surveillance and the utility would be increased through a better integration between the two systems, as happens through the joining of health service[34].

In the last years the emerging diseases gained a leading role in epidemics on global scale, and zoonoses are dominant.[35] These diseases are currently the main and global threat for human health, and are related to both domestic and wildlife fauna. Therefore, the synergy between medicine and veterinary medicine is indispensable for the research, the surveillance and the control of this global health challenge. The result of this cooperation is well known in developing countries, where it already resulted in an improved health care for the local populations[36].

The focus of veterinary medicine in public health is not limited to zoonoses, parasitosis, and food safety, and its activities are not confined to institutions, authorities and healthcare system. Indeed, it is important to note that the human health concept involve all aspects, including mental health via the human-animal bond phenomenon. This latter aspect gives to companion animals clinical practice an important role in maintaining and improving human health, as evidenced by the One Health mission statement:

> *"Recognizing that human health (including mental health via the human-animal bond phenomenon), animal health, and ecosystem health are inextricably linked, One Health seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, other scientific health and environmental professionals and by promoting strengths in leadership and management to achieve these goals".*

As reported above, the health of ecosystem is also considered by the One Health concept. Indeed, both animals and humans live in the same environment, sharing the air, the water and the food. If there is no health for the environment, there is no health for people and animals. The pollution is not the only threat, because the health of plants is indispensable for having food[37].

Therefore, environmental sciences were added to human and veterinary medicines in describing One Health approach . Thus, this latter one, has a broad and multidisciplinary scope, being health of humans, animals and environment interrelated.

This approach represents a change in perspective also when considering disease control and prevention, because it emphasizes the role of disease emergence instead of the transmission. This different point of view allows to adopt new strategies for global health at technical, social and institutional level[38].

The collaborative effort between human and veterinary medicine should be applied not only at global level but also at national level, where could be a new paradigm of health management[39]. This will result in a more effective and sustainable organization of public health, reducing the risk of zoonotic and foodborne diseases such as rabies, H5N1 avian influenza, West Nile fever, E. coli STEC, Staphyloccus aureus MRSA, tuberculosis, Crimean-Congo hemorrhagic fever, Rift Valley fever and diseases caused by Ebola, Nipah, Hendra and Marburg viruses and Hantaviruses. This approach should consider also animal-origin agents emerged as zoonoses leading to a high public health impact threat such as HIV and SARS.

One Health approach has been endorsed by the main global health organizations, as WHO, CDC[40], EFSA[41], The World Organization for Animal Health (OIE)[42], FAO.

Particularly, FAO emphasizes the One Health concept highlighting its value in protecting human and animal health, in reducing diseases and in ensuring a safe food supply, through an effective and responsible management of natural resource. All these goals are tightly connected with FAO mandate and its technical expertise, giving to FAO a leading role in One Health. The partnerships

identified to achieve One Health are OIE, WHO, United Nations Environment Programme (UNEP) and the International Atomic Energy Agency (IAEA)[43].

Previously, in cooperation with WHO, OIE, UNICEF, UN System Influenza Coordination and The World Bank, FAO developed a Strategic Framework focused on emerging infectious diseases at the animal-human-ecosystem interface [44]. More recently, FAO promoted a shared effort to increase the knowledge of One Health and its implementation in Central and East Africa[45].

1.3 Communication in Veterinary Medicine for human health

The final objective of veterinary medicine is public health, which is improved and guarded via animal health maintenance and food safety. Veterinarians have a broad education on medicine and clinical science, including anatomy, physiology, parasitology, pathology, anatomical pathology, virology, microbiology, epidemiology, population health, infectious diseases, zoonoses, therapy and pharmacology, preventive medicine, ethology, behavioral medicine, and all the same clinical and surgical specialization of human medicine. Moreover, they deal with patients of different species and are familiar with comparative medicine. Their activities are not limited to domestic animals, but also concern wildlife fauna and even environmental issues. In addition, they have a specific education on nutrition, food production, food technology, food safety and inspection.

Due to this educational training, contributions of veterinarians to public health are multiple and cover several different fields such as:

- Institutions, health authority and healthcare system
- Clinical practice
    - companion animals
    - livestock
- Food safety and nutrition
- Pharmacology and drugs
- Wildlife fauna
- Environment

Health communication has a key role in all the fields listed above. In the next pages the main topics will be exemplified with more details.

1.3.1 Institutional communication for public health: the example of the Piano Regionale di Prevenzione Veterinaria 2012-2014, Regione Lombardia (Regional Veterinary Prevention Plan of Regione Lombardia)

Institutional communication in Italian health system is unique at the higher institutional level, because Ministero della Salute (Ministry of Health) supervises both human and veterinary medicine. At lower institutional level, such as regional and local level, health authorities work separately on human and animal health, and the communication efforts are uncoordinated despite to the continuous overlapping between veterinary medicine and human medicine in public health.

A peculiar experience in veterinary institutional communication involved Dept. of Veterinary Science and Public Health (DIVET) and our research group. Therefore, we chose it as example of veterinary institutional communication for public health.

In 2010, DIVET was designed by Regione Lombardia to develop the regional veterinary prevention plan (PRPV). Our research group cooperated with members of UO Veterinaria (veterinary operative unit) of Regione Lombardia and IZLER (Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna: regional diagnostic lab).

This new PRPV is a powerful tool supporting veterinary health system at regional level, giving to all operative units and officers an unique and coherent frame of reference[46]. Indeed, the research group developed a model (scorecard) to assess zoonoses and food safety issues. The scorecard supports daily practice setting priority in prevention and risk management, by assigning different values to various risk and management aspects of each disease or food safety problem. Once this assignation has been done, veterinary officers know which is the priority of each intervention and also if there is a lack in information about the specific disease.

This model established a completely new praxis for risk characterization in Italian public health, and it had to be understood and adopted by all the personnel involved in regional veterinary system. One of the parameters considered for an effective communication of the PRPV was its graphic aspect. The document had many tables (the scorecards) and schemes for disease control plans, prevention

protocols and risk characterization, each one concerning one of the veterinary areas. Indeed, in Italy the veterinary health system has three areas: A for animal health, B for food safety and C for herd management and animal welfare. Due to the high amount and complexity of information delivered, we chose a simple and immediate graphic, assigning a specific color to each area. Every information addressed to A area was green, to B area was red and to C area was yellow. Everything concerning the past or general topics was blue.

This simple color code had a very useful function clarifying the whole document and making it more understandable. Moreover, this code made uniform every local health authority, making them having the same color for the same unit. All the veterinary officers recognized themselves in the color of their area, independently by the district of the ASL (Azienda Sanitaria Locale: local health authority).

Therefore, the primary aim of the PRPV, a uniform veterinary health system, was reached also with this simple communicative choice.

1.3.2 Risk communication and food safety

Consumers receive several information about food, but often they are contradictory and conflicting. These include: alerts, recommendation on what is good for health and what could be dangerous, risks and benefits associate in the same food, food components to reduce and nutrients to increase, warning on different diets and eating styles. All these information provide a non-unique frame of reference, which is difficult to manage and to understand by consumers. Sometimes unfounded concerns may overlap reliable messages from health authorities, resulting in more confusion and uncertainty.

Especially during an alert or an outbreak, this situation may lead to fear and distrust in the product involved. Examples are the recent European food scares on E. coli in vegetables, horsemeat scandal, blue mozzarella cheese, BSE and avian influenza.

When consumers' behavior has the potential to reduce the risk, an effective communication is fundamental to protect public health. Moreover, to reinforce consumer confidence is important to avoid misleading messages that may cause serious consequences on the entire food supply chain.

To meet these needs EFSA developed risk communication guidelines "When Food Is Cooking Up a Storm – Proven Recipes for Risk Communications", published in 2012.

The EFSA activity in risk communication is strong and wide[47] [48], and include also its participation to FoodRisC project[49].

1.3.3 Risk communication and health campaigns to reduce use of antibiotics and antimicrobial resistance

The concern on antimicrobial resistance (AMR) increased in recent years; it is considered a major public health threat, due to misuse of antibiotics in both humans and animals therapies.

To highlight the problem and to support a rational antimicrobial use, European Union promoted the European Awareness Day, an health initiative marked annually on 18 November and coordinated by European Center for Diseases Prevention and Control (ECDC). For this event, ECDC provides campaign communication materials for the European national health authorities in order to develop a consistent communication campaign on the prudent use of antibiotics. National campaigns use several communication tools, such as leaflets, poster, videos, websites and social media, which are aimed to both prescribers and general public. Many initiatives on communication take place across Europe, to disseminate messages on risks related to an antibiotic misuse and explaining how to take antibiotics responsibly[50, 51].

Similar campaigns are promoted also in the United States, Canada and Australia[52-54].

All these programs show the importance of communication in human medicine to contain AMR, but it is a cross-disciplinary issue involving veterinarians to reduce and monitor antimicrobial usage in livestock[55, 56].

1.3.4 Patient-provider communication

The importance of communication in clinical practice has been widely recognized, even if only recently in veterinary medicine. Indeed, even if veterinarians have animal patients, there is at least one person for every pet treated. Therefore, in veterinary medicine communication is not less important than other clinical skills. Moreover, the final objective of veterinary practice is public health, which concerns all the aspects of human health, including mental health and emotional aspects via the human-animal bond phenomenon [57].

Effective communication is related to enhance patient satisfaction and compliance [58] in human as well as in veterinary medicine [59, 60]. The importance of communication in veterinary profession has been confirmed by several studies[61, 62], and this skill has become part of education programs in many countries [63, 64].

Communication is as important as other clinical skills also in veterinary medicine, where the patient-provider communication became client-veterinarian communication. As well as in human medicine, applying adequate medical knowledge to diagnose and to treat a patient is not the only requirement for success [65]. Indeed, there are many evidences of the strategic role of communication, both in food-producing and in companion animal practices [66-74]. Moreover, it must be emphasized the different nature of the interactions between practitioner and client in these two areas of veterinary clinical practice. Depending on whether the patients are livestock or companion animals, the relationships established between clients and their animals are as different as the aims of veterinary practice. Indeed, in food animal practice, there is not an emotional relationship with the animal, and the aim of the practitioner is to keep the animal healthy in order to improve production efficiency and food safety. Therefore, the pattern of this clinical activity is completely different from the one in human medicine. Conversely, pet care mirrors human medicine approach. Thus, veterinary clinic or hospital organization, diagnostics and specialized pet care reproduce human medicine patterns. Within this framework, pet owner is in a peculiar patient-provider interaction: he/she could be emotional affected, is involved in health decisions and is responsible for pet's health care at home.

Due to this similarity, available human studies on patient-provider interaction may be useful to investigate and to improve client-veterinarian interaction too. Many efforts have been done in this direction in the veterinary field [60]. However, even if this pattern resembles pediatric clinical practice, there is an important difference: pet owners could be, or not, emotionally affected. In our vision, this is the peculiarity of veterinary practice.

Despite several studies in many countries showed the important role of communication in veterinary medicine, both in companion and large animal practice, in our knowledge in Italy there are no data or studies on communication aspects in veterinary practice. Moreover, in this country there is a significant gap in communication training for veterinary students, resulting in a lack of communication skills in veterinary professionals.

1.3.4.1 Companion animals practice

This situation may lead to communication mishaps and failures in meeting client expectations and, eventually, to complaint or malpractice claim[75]. These problems and gaps are even of a larger importance when peculiar circumstances as breaking bad news are considered, this latter one being a significant problem for the veterinary medicine worldwide[76, 77].

Bad news has been defined as any news that drastically and negatively alters the patient's view of her or his future [78]. In a more detailed definition, bad news are described as "situations where there is either a feeling of no hope, a threat to a person's mental or physical well-being, a risk of upsetting an established lifestyle, or where a message is given which conveys to an individual fewer choices in his or her life" [79]. Specifically, in veterinary medicine, these feelings concern both health and future of own pet.

Delivery bad news is a challenge for practitioners and clients. Veterinarians have to deal patient’s death more often than other health care professionals, and they cope with death and euthanasia in different ways [80].

In human medicine have been identified many other factors that contribute to physician discomfort during physician-patient encounters, and that could be used as a guide in veterinary field too, including concerns on how the news will affect patient, perception of failure, feeling to be responsible, feelings of frustration and lack of training [81, 82].

Consideration of pet, defined as the importance attributed to the pet by its owner, varies individually and also differs from country to country, depending on cultural aspects and traditions. This may affect owner response to bad news and role of communication[76]. Since the owner is not the patient, it can't be taken for granted that what physician tells is always important for the client. In our vision this aspect is peculiar of the veterinary medicine, and especially in a country like Italy where pets receive a lower consideration when compared to other countries. Indeed, there are evidences that the acknowledgment of pets as family member leads to an increased expectation for the best medical care available. Studies showed as 70% of pet owners are affected emotionally by the death of their pet. Thirty percent of pet owners had experience of severe grief knowing that pet was dying or died, and 45% of them feel guilty about euthanasia [76]

Moreover, a lack of awareness by the veterinary practitioner of these emotional aspects may affect the communication approach with the owner and it has the potential to increase pet owner grief [81, 83].

1.3.4.2 Large animals practice: "From farm to fork" approach

Importance of communication and its role in dairy herd health, improving management and clinical outcomes, has been recently demonstrated by several studies[69, 72, 84, 85]. Effective communication has a key role in dairy herd health and communication strategies support diseases control programs[71] [67].

In dairy farm advising, the veterinarian delivers news and information to farmer. How information is delivered has the potential to affect ideas and beliefs of receiver and, thus, his/her behavior and actions. This aspect is crucial for public health because the quality of milk and milk products is

directly influenced by farmer's actions and management. In example, farmers' attitudes have been shown to explain variations in mastitis incidence, and this evidence is to be considered in the development of communication strategies supporting mastitis control programs[85]. Moreover, another study showed the role of farmers' motivation in adopting suggested practices and outlined which factors have the potential to influence the motivation itself[84].

In order to reach effective communication, advisors should listen to farmers' needs and feedback, tailoring information on specific farmers' characteristics and learning style [72]. Indeed, educating and motivating farmers have been recognized as key issues of the effective veterinary practice, which should offer services both for education and for problem solving [69, 71].

Therefore, the leading role of communication in dairy herd management is based on its power in improving herd health and production safety, influencing how farmers apply consultants' advice.

However, communication in veterinary practice is poorly considered in Italy. None of the veterinary schools has a course on communication, neither for students or for veterinarians. This leads to a lack of communication skills in veterinary professionals. Moreover, Italian dairy farms are visited by several advisors: veterinarians, non-vet practitioners, animal feed and pharmaceutical representatives. Usually these latter two groups are trained on communication by their companies, but the former two do not receive an analogous professional training.

At present, studies on the interactions between herd advisors and farmers are not available in Italy.

2. OBJECTIVES

Veterinary medicine competences include a broad spectrum of aspects, which can't be covered in a single study. Moreover, we were interested in investigate if communication has a role also in the veterinary areas traditionally considered less linked to public health. Therefore, this study was focused on clinical communication, both in companion and in food-producing animals practice.

More specifically, the research reported in this thesis aimed to investigate:

A. Patient-provider communication and BBN in companion animal practice

The aim of this study was to perform for the first time an investigation about client-practitioner communication and breaking bad news in Italian veterinary practices, assessing what owners most appreciate and dislike. Furthermore, this study aimed to verify if the pet consideration is related to parameters like geographical origins, sex and household composition, and if it affects the importance of communication both in normal practice and in delivering bad news.

B. "From farm to fork" approach: improving dairy health management to improve food quality

Aim of the study was to investigate the role of communication in Italian dairy farms, identifying farmers' satisfaction level about consultants' communication approach and responses to their needs. Moreover, the study analyzed if parameters such as milk yield, herd size and milk quality expressed by Bulk Milk Somatic Cell Count (BTM SCC) influence farmers perception of communication and problems affecting dairy farm, in order to define predictors of farmers' response.

3. MATERIALS & METHODS

3.1 Questionnaire

Study A

A questionnaire with 23 closed ended questions, divided into three parts, was developed.

The first part (questions 1 to 8) was focused on collecting data about sex, age, scholar level, origins, number of family members, type and number of animals. In this first part a specific question addressed how owner considers his/her pet.

The second part (questions 9 to 22) was specifically focused on bad news interaction. In the survey bad news was defined as "a negative information you received from your veterinarian regarding your pet, such as a disease that you consider serious or death". Among the different questions, owners were asked how they would consider the experience and if the veterinarian had an influence on how the situation was perceived by the client. It was also asked how the bad news was delivered and if the client appreciated that choice.

Participants were then asked how they felt after the bad news and if the practitioner seemed to share the concern, if there was a physical contact with him/her and if they are overall satisfied with the way in which they received the news.

Finally, question 23 aimed to assess client satisfaction on communication with veterinarian.

Study B

A questionnaire for farmers was developed; it consisted in 9 major topics with several questions as described in the Table 1. It was possible to answer to any question selecting a score from 1 to 5, where 1 was the lowest grade and 5 the highest one.

Table 1: Questionnaire structure and questions

Topic	Figure or aspects
Information needs regarding diseases	Mastitis, abortions, hypofertility, calves diseases, lameness, IBR, BVD, metabolic disease
Information needs regarding aspects of herd management and animal welfare	Cow nutrition, heifer nutrition, herd management, milking, new technologies
Preferred information sources	Farmer magazines, study groups, Internet
Usual information sources	Vet practitioner, non-vet practitioner, representative, farmers, magazines, study group, Internet
The ideal veterinarian: importance of skills	Exhaustive, clear, intelligible, practical, useful
Consultants' skills and farmers' satisfaction level for:	Exhaustive, clear, understandable, practical, useful, proactive
Vet practitioner	
Non-vet practitioner (nutritionist, agronomist)	
Salesmen pharma. companies	
Salesmen feeding companies	

3.2 Participants and data collection

Study A

In order to avoid possible environmental bias, the questionnaire was not administered to clients in veterinary clinics and hospitals. Moreover, the sample was chosen in the same age group to avoid bias due to age and different experience. Therefore, the participants in the study were first year students of Veterinary Medicine and Veterinary Biotechnologies courses of Veterinary Medicine School at University of Milan. To avoid potential bias related to the professional information acquired during courses, only students at the beginning of the first year were enrolled. Even if we cannot exclude a bias related to participants' characteristics, the respondents, in our opinion, reflect more precisely than vet clinics clients the social behavior in Italian society, at least for people between 19 and 29 year of age. Questionnaires were administered without any additional information which could influence the answers.

In order to ensure privacy, questionnaires were collected all together in an opaque envelope.

Study B

The questionnaire was made available on the website of major Italian farmer magazine (Informatore Agrario) and sent to all the subscribers. The farmers had the choice to answer directly on the website or to send the compiled questionnaire to the publisher of Informatore Agrario at no costs.

Data analysis

Study A

All questionnaires were recorded into a database and analyzed by FREQ procedure of SAS 9.2 (SAS Institute, Cary NC) and for trend analysis with Cochran-Armitage trend test on StatXact software (Cytel Corp.Cambridge, MA). Statistical significance level was set at α=0.05.

Study B

Data were collected on a database and analyzed by a statistical software (SPSS 20, IBM Corp.).

Scores were compared by non-parametric methods applying Kruskal-Wallis ANOVA and statistical significance level was set at α=0.1.

4. RESULTS

Study A. Patient-provider communication and BBN in companion animal practice

Data description

The sample size was defined by the number of respondents who had experience as pet owners: overall 108 valid questionnaires were considered, out of 145 administered. Sixty five respondents were females and 43 males. They were born in different Italian regions: 78.1% were from Lombardia, where Veterinary Medicine School is located, 17.15% from other Italian regions and 4,75% from other countries (France, United States, Israel, Philippines, Egypt). All of them lived permanently in Italy.

The ages ranged from 18 to 29 years, with 48 respondents under 20 years and 60 between 21 and 29 years. One hundred and six of them were living with their family, while only 2 were living alone.

Respondents were owners of several animal species. Many of them had more of one animal, but 27.78% of respondents had two different species and 19.44% had three or more different species at the same time. When only respondents who experienced bad news were considered these frequencies changed and a larger number of owners of two or more different species (two: 29.09%; more than two: 27.27%) was observed.

A detailed description of frequencies for respondents' characteristics was reported in Tables 2a and 2b.

Despite the relatively small sample, the statistical analysis showed significant differences, as reported in Table 3 and 5. People considering the pet as an animal were 21.3%, while 78.7% considered it as a family member. Answers giving the higher value to pet, i.e. "a family member" (36.11%) or the more important "a family member whom I have a special relationship with" (36.11%), showed the highest frequencies. When compared to males, females were more inclined to consider pet as a family member, with a significant difference at χ^2 test (P=0.0201). The importance of pet increased when family size decreased, with a significant trend at Cochran-Armitage Trend Test

(P<0.0315). When in the same family there are more of two species at the same time, a numerical increase in perception of pet as a family member was observed.

Seventy-seven percent of subjects having 2 or more dogs consider them as family members, while the frequency was 90.91% for ones having 2 or more cats. When a single pet cat or dog was owned, these frequencies were respectively 77.42% and 82.22%, but these differences were not statistically significant.

Participants from Lombardia considered pet as relative most frequently than responders from other regions, although region of birth didn't result to be a significant factor to explain differences in frequencies.

Table 2a: Sample description. Data on owner and family characteristics

Parameter	Class	N (%)
Gender	Male	43 (39,81%)
	Female	65 (60,19%)
Origins	Italy	100 (95,25%)
	Out of Italy	5 (4,75%)
Household composition	≤2	6 (5.56%)
	3	26 (24.07%)
	4	58 (53.70%)
	>4	18 (16.67%)
Pets owned at the same time	<3	5 (4,67%)
	3	26 (24,3%)
	4	58 (54,21%)
	5 or more	18 (16.82%)
How many different species in the same household	1	57 (52,78%)
	2	30 (27,78%)
	3 or more	21 (19,44%)
How do you consider your pet?	One of my properties	0 (0,00%)
	Just an animal	8 (7,41%)
	Part of my life, but the family is another thing	15 (13,89%)
	A family member	39 (36,11%)
	A family member whom I have a special relationship with	39 (36,11%)
	My son/daughter	7 (6,48%)
Have you ever had bad news from a vet?	Yes	55 (50,93%)
	No	53 (49,07%)
Are you satisfied with vet communication?	Yes	87 (80,56%)
	No	12 (11,11%)
	I'm not sure	9 (8,33%)

Table 2b: Sample description. Data on own pet number and characteristics.

Dogs	None	40 (37,38%)
	1	45 (42,06%)
	2	12 (11,21%)
	3 or more	10 (9,34%)
Cats	None	54 (50,47%)
	1	31 (28,97%)
	2	13 (12,15%)
	3 or more	9 (8,41%)
Horses	None	97 (90,65%)
	1	5 (4,67%)
	2	4 (3,74%)
	3 or more	1 (0,93%)
Turtles	None	94 (87,85%)
	1	8 (7,48%)
	2	1 (0,93%)
	3 or more	4 (3,73%)
Rabbits	None	95 (88,79%)
	1	8 (7,48%)
	2	4 (3,74%)
	3 or more	0 (0,00%)
Rodents	None	100 (93,46%)
	1	3 (2,80%)
	2	3 (2,80%)
	3 or more	1 (0,93%)
Snakes	None	106 (99,07%)
	1	1 (0,93%)
	2	0 (0,00%)
	3 or more	0 (0,00%)
Birds	None	97 (90,65%)
	1	3 (2,80%)
	2	2 (1,87%)
	3 or more	5 (4,66%)
Fish	None	93 (86,92%)
	1	2 (1,87%)
	2	0 (0,00%)
	3 or more	12 (10,27%)

Tab. 3. Statistical analysis on response classified by on how pet is considered.

Parameters	Class	How pet is considered		χ^2
		Just an animal	A family member	
Owner's gender	Male	14 (32,56%)	29 (67,44%)	P=0,0201
	Female	9 (13,85%)	56 (86,15%)	
How many people in the household	≤2	0 (0,00%)	6 (100%)	P=0,1385
	3	4 (15,38%)	22 (84,62%)	
	4	12 (20,69%)	46 (79,31%)	
	>4	7 (38,89%)	11 (61,11%)	
Amount of species in the same household	1 species	13 (22.81%)	44 (77.19%)	P=0,6812
	2 species	7 (23.33%)	23 (76.67%)	
	3 or more species	3 (14.29%)	18 (85.71%)	
Dogs in the same household	1	8 (17,78%)	37 (82,22%)	P=0,6304
	2 or more	5 (22,73%)	17 (77,27%)	
Cats in the same household	1	7 (22,58%)	24 (77,42%)	P=0,1975
	2 or more	2 (9,09%)	20 (90,91%)	
Origins	Lombardia	16 (19.51%)	66 (80.49%)	P=0,4212
	Other	7 (29.92%)	19 (73.08%)	

Bad news

Fifty-five participants had experience of bad news. This experience was terrible for 23 people, bad for 24 people, and not a problem for 8 people. A detailed description of this subset of data is reported in Table 4.

Around 81% of participants was satisfied by the way bad news was delivered. However, communication showed to be less critical when the pet is not important: 100% of people considering the pet just an animal are satisfied with the way bad news was delivered. Data analysis (Table 5) showed a positive significant association between perception of bad news and value attributed to the pet (P=0.0149). Indeed, fifty percent of people considering the pet as a family member described it as a terrible experience, while if the pet is considered just an animal, bad news is never terrible and is "not a problem" in 33.33%% of the cases.

However, we report an unexpected result: 34.78% of people considering animal as a family member describe BBN as not a bad moment, although there is a consistent and significant trend in the worsening of the experience (P<0.0049 at Cochran-Armitage trend test), when the pet is considered

as a family member. In order to explain this result, a cross analysis was performed, considering also how people felt after bad news. Data showed as 25.93% of total sample considers pet as family member but they didn't feel sad after bad news. This later unexpected result suggests that further studies are needed to investigate more thoroughly this aspect.

As expected, who consider pet as a relative appears to be more demanding about patient-practitioner communication. For example, the majority of people (78.26%) considering the pet as a family member referred that practitioner didn't share their grief or was not sincere. Moreover, all respondents reporting that practitioners did not try to explain every therapeutical option consider pet as a family member. None of the respondents considering it just an animal was unsatisfied about the way bad news was delivered.

Table 4. Breaking bad news sample characteristics.

Parameter	Class	N° (%)
How would you describe BBN experience?	Terrible	23 (41,82%)
	Bad	24(43,64%)
	Not a problem	8 (14,55%)
How many different species in the household	1	24 (43,64%)
	2	16 (29,09%)
	>2	15 (27,27%)
How vet delivered bad news?	Face to face	53 (96,36%)
	By phone	2 (3,64%)
Did you appreciate it?	Yes	55 (100%)
	No	0 (0,00%)
In which way the vet told you bad news?	Indirectly	3 (5,45%)
	Directly	50 (90,91%)
Did you appreciate it?	Yes	96,36%)
	No	1(1,82%)
Words were:	Clear and simple	53 (96,36%)
	Difficult to understand	2 (3,64%)
The place were bad news was delivered was adequate?	Yes	47 (90.38%)
	No	5 (9,62%)
Did the vet share your grief?	Yes	32 (58,19%)
	No/ I don't think he/she was sincere	23 (41,82%)
Was used physical contact when delivering bad news?	Yes	2 (3,64%)
	No	53 (96,36%)
Did you appreciate it?	Yes	52 (94,55%)
	No	3 (5,45%)
Monetary aspect was important in evaluation of bad news?	Yes	5 (9,09%)
	No	50 (90,91%)
How did you feel after bad news?	Desperate and very sad	11 (20%)
	Very sad	23 (41,82%)
	Sad but under control	20 (36,36%)
	Normal	1 (1,82%)
	Relaxed	0 (0,00%)
Vet's gender	Male	35 (63,64%)
	Female	20 (36,36%)
Are you satisfied by the way you received bad news?	Yes	44 (80%)
	No	11 (20%)

Table 5. Statistical analysis of BBN sample classified by on how pet is considered.

BBN PARTICIPANTS		Just an animal	A family member	χ^2
How would you describe BBN experience?	Terrible Bad Not a problem	0 (0%) 6 (25%) 3 (37,50%)	23 (100%) 18 (75%) 5 (62,50%)	P=0,0149
Are you satisfied with vet's communication?	Yes No	9 (20,45%) 0 (0%)	35 (79,55%) 11 (100%)	P=0,1010
The vet seemed to attend to your problem or share your concern?	Yes No/ I don't think he/she was sincere	4 (12,50%) 5 (42,2%)	28 (87,50%) 18 (57,8%)	P=0.472
Did the vet try to explain every therapeutical options in order to make you understand what was possible and let you make the best choice?	Yes No	9 (17,65%) 0 (0%)	42 (82,35%) 4 (100%)	P=0,3583
The place were bad news was delivered was adequate?	Yes No	9 (19,15%) 0 (0,00%)	38 (80,85%) 8 (100%)	P=0,1759
Are you satisfied by the way you received bad news?	Yes No	9 (20,45%) 0 (0,00%)	35 (79,55%) 11 (100%)	P=0,1010
Are you satisfied by vet's communication?	Yes No	9 (18,75%) 0 (0,00%)	39 (81,25%) 7 (100%)	P=0,2103

After the news, the majority (61.82%) of people was very sad and in 58.19% of cases veterinarian appeared sharing the concern, but 21.82% of participants think that he/she was not sincere and 20% thinks that he/she did not share it. Only 3.64% described a physical contact between veterinarian and client, and almost all people appreciated the physical distance even though 5.45% would have preferred a physical contact. Overall, 9.09% of participants reports the client's need of a physical contact with the practitioner when he/she is delivering bad news.

In the vast majority of cases (96.36%), the room where the encounter took place was adequate, large enough to accommodate all family members, and time required to understand bad news was given. However, characteristics (dimensions, silence) of the places where bad news was delivered were perceived as negative if the pet is considered as a family member (14.7%).

Practitioners who have delivered bad news were mostly men (63.64%). Almost in all cases (96.36%) bad news has delivered in a face to face encounter, and this choice was appreciated by all

participants. Veterinarian delivered bad news directly, using the name of disease (90.91%), and this was appreciated by almost all participants (96.36%).

The statistical analysis showed as there was no association between BBN experience and practitioner's behavior (Table 6). Overall, people who received bad news were more satisfied by usual client-veterinarian communication than the entire sample (87.28% vs 80.56%), but less satisfied by communication related to BBN experience (80%).

No one considering the pet just an animal says to be unsatisfied about the way bad news was delivered or about the usual communication with vet.

Table 6. Statistical analysis on the relationship between how veterinarian delivered the BBN and the perceived experience

BBN PARTICIPANTS		Experience: terrible	Exp.: bad	Exp.: not a problem	χ^2
How was the vet while delivering bad news?	Kindly	11 (37,93%)	14 (48,28%)	4 (13,79%)	P=0,5935
	Irrelevant	10 (43,48%)	10 (43,48%)	3 (13,04%)	
	Bad	2 (66,67%)	0 (0,0%)	1 (33,33%)	

Study B. "From farm to fork" approach: improving dairy health management to improve food quality

Data description

Eighty-one questionnaires were collected, half of them on web site and half by mail. The response rate was low, but this result was expected. There are two major reasons for this relative low response: the short time available to answer (2 months) and the season (summer) when farmers spent most of their time working in fields. Indeed, most of Italian dairy farms are family farms with very few or no employees.

Responders were farmers from 28 different Italian provinces. Italian Holstein was the breed in 82.05% of the responding herds, while in 17.95% there were other or mixed breeds. Respondent herd size (lactating cows) distribution was the following: <100 (57.89%), 101-200 (28.94%), > 200 (13.17%). Respondent herd average milk yield (kg/year) distribution was the following: <7000 (9.46%), 7001-8000 (13.52%), 8001-9000 (17.56%), 9001-10000 (32.43%), >10.000 (27.03%). Respondent herd average Bulk Tank Milk (BTM) SCC (cells/µl) distribution was the following: <200 (48.6%), 210-300 (33.33%), > 300 (18.66%).

However, even if they were not selected at random, responders' population characteristics and geographical distribution showed to be very similar to the Italian dairy herds scenario.

Information needs

When diseases were considered, we observed statistically significant differences among the diseases investigated. Three of them, mastitis, reproductive problems and metabolic diseases (Table 7a) had more than 60% of answers with a score of 4 or 5 and express the greatest interest. Viral diseases such as IBR and BVD received the lowest interest, despite being present in Italy and affecting a good number of herds. A medium level interest was expressed towards issues related to animal welfare, such as lameness and calves diseases, and also abortion.

When these outcomes were considered in relation to farm characteristics as size, milk yield and SCC, a significant difference was observed only for the interactions between milk yield and lameness or BVD (Table 7b).

Within management issues, nutrition had the higher score, with 70% of scores being 4 and 5 (Tables 8a and 8b). It was followed by heifer nutrition and dairy herd management. Unexpectedly, the interest towards milking and milking machines is lower than towards the other topics. Analysis considering farm characteristics gave a result statistically significant just in few cases.

Table 7a: Statistical parameters and distribution of scores for the question ""How much are you interest in receiving information about each of the following disease?"

Question	Median	Mean	Std.Dev.	Score Frequencies				
				1	2	3	4	5
Mastitis	4.00	3.84	1.04	1.3	10.1	25.3	30,4	32.9
Abortion	3.00	3.17	1.20	6.6	26.3	28.9	19.7	18.4
Infertility	4.00	3.75	1.09	2.6	13.2	19.7	35.5	28.9
Calves dis.	4.00	3.32	1.23	6.8	24.7	17.8	31.5	19.2
Lameness	3.00	3.31	1.23	9.1	15.6	32.5	20.8	22.1
IBR	3.00	2.80	1.16	12.2	29.7	36.5	9.5	12.2
BVD	3.00	2.92	1.17	12.3	23.3	37.0	15.1	12.3
Metab. dis.	4.00	3.73	1.16	6.5	7.8	22.1	33.8	29.9

Table 7b: Results of statistical analysis of responses to the question "How much are you interest in receiving information about each of the following disease?" classified by herd size, production and bulk milk SCC

Question	Size	Milk Yield	SCC
Mastitis	-[1]	-	-
Abortion	-	-	-
Infertility	-	-	-
Calves diseases	-	-	-
Lameness	-	0.011	-
IBR	-	-	-
BVD	-	0.072	-
Metabolic diseases	-	-	-

[1] – : not significant

Table 8a.How much are you interest in receiving information about each of the following topics?

Question	Size	Milk Yield	SCC
Cow nutrition	-[1]	-	-
Heifer nutrition	-	-	0.066
Dairy herd management	0.037	-	-
Milking and milking machines	-	-	-
New technologies for farm	-	0.082	-

[1] – : not significant

Table 8b : Statistical parameters and distribution of scores for the question ""How much are you interest in receiving information about each of the following disease?"

Question	Median	Mean	Std.Dev.	Score Frequencies				
				1	2	3	4	5
Cow nutrition	4.00	4.04	0.952	-	7.8	19.5	33.8	39
Heifer nutrition	4.00	3.68	1.08	2.6	14.1	21.8	35.9	25.6
Dairy herd management	4.00	3.79	1.16	1.3	16.9	20.8	23.4	37.7
Milking and milking machines	3.00	3.25	1.10	3.9	23.7	31.6	25	15.8
New technologies for farm	4.00	3.64	1.14	2.6	14.3	31.2	20.8	31.2

Farmers mostly want information from study groups, they are less interested in magazines and have a very low interested in the web (Tables 9a and 9b). However, their usual information sources are farm's veterinarian and magazines. The role of vet as a valuable source of information has relative little changes in relation to BTM SCC. Highest scores (4,5) for farmers as a source of information increased as BTM SCC went up, suggesting that a general dissatisfaction with professional advice when problems became relevant (Tables 9c and 9d).

Table 9a.Which is your preferred information source regarding the previous topics?

Question	Size	Milk Yield	SCC
Farmer magazines	0.063	-[1]	-
Study groups	-	-	-
Internet	-	-	-

– : not significant

Table 9b.Which are your usual information sources?

Question	Size	Milk Yield	SCC
Vet practitioner	-	-	0.077
Non-vet practitioner	0.091	-	-
Salesmen	-	-	-
Farmers	-	-	0.092
Magazines	-	-	-
Study groups	0,31	-	-
Internet	-	-	-

– : not significant

Table 9c. Distribution of preferred and usual information sources statistically significant by herd size

Question	Size	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Preferred: Farmer magazines	<100	0.063	300	3.24	1.28	11.9	14.3	33.3	19.0	21.4
	100-200		4.00	3.52	1.17	-	28.6	14.3	33.3	23.8
	>200		5.00	4.30	1.06	-	10.0	10.0	20.0	60.0
Usual: Non-vet practitioner	<100	0.091	3.00	3.05	1.06	9.5	19.0	33.3	33.3	4.8
	100-200		4.00	3.52	1.29	9.5	9.5	28.6	23.8	28.6
	>200		3.00	3.22	0.83		11.1	66.7	11.1	11.1
Usual: Study groups	<100	0.31	3.00	2.88	1.02	7.5	30.0	35.0	22.5	5.0
	100-200		4.00	3.45	1.06	-	27.3	13.6	45.5	13.6
	>200		2.00	2.22	1.20	33.3	33.3	11.1	22.2	-

Table 9d. Distribution of usual information sources statistically significant by SCC

Question	SCC	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Vet practitioner	<200	0.077	4.00	3.75	1.23	5.6	11.1	22.2	25.0	36.1
	200-300		3.00	3.52	0.71	-	4.0	48.0	40.0	8.0
	>300		4.00	3.62	1.04	-	15.4	30.8	30.8	23.1
Farmers	<200	0.092	3.00	2.61	0.96	11.1	36.1	36.1	13.9	2.8
	200-300		2.50	2.82	1.40	18.2	31.8	18.2	13.6	18.2
	>300		3.00	3.62	1.26	-	23.1	30.8	7.7	38.5

Communication with consultants

There are statistically significant differences between medians of ideal veterinarian and own herd veterinarian (Table 10). As expected, the higher scores are more frequent in the ideal vet than in the real vet, and scores under 5, particularly 3 and 4, are more frequent in the real vet. This outcome shows that veterinarian performance is far from the desired one. The classification of results by farm characteristics showed just occasional statistical effects (Tables 11 and 12, Fig. 1).

Table 10. Statistical comparison of scores recorded for the questions: "The ideal vet: how much important are the following skills" and "Your vet: how much he/she has the following skills?"

Question	Strata	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Exhaustive	Ideal vet	0.04	4	3.75	0.97	1.3	5.3	38.2	27.6	27.6
	My vet		3.00	3.43	0.88	1.3	12.0	40.0	36.0	10.7
Clear	Ideal vet	0.00	4.00	4.22	0.83	-	4.1	13.5	39.2	43.2
	My vet		4.00	3.63	0.87	1.4	4.1	42.5	34.2	17.8
Understandable	Ideal vet	0.00	4.00	4.27	0.79	-	2.7	13.3	38.7	45.3
	My vet		4.00	3.59	1.03	2.7	10.7	33.3	32.0	21.3
Practical	Ideal vet	0.00	5.00	4.40	0.88	-	6.7	6.7	26.7	60.0
	My vet		4.00	3.8	0.99	2.7	6.8	24.3	40.5	25.7
Useful	Ideal vet	0.00	5.00	4.39	0.81	1.3	2.6	5.2	37.7	53.2
	My vet		4.00	3.82	0.90	1.3	5.3	27.6	42.1	23.7

Table 11. The ideal vet: how much important are the following skills?

Question	Size	Milk Yield	SCC
Exhaustive	-[1]	-	-
Clear	-	-	-
Understandable	-	-	-
Practical	-	-	-
Useful	-	-	-
Other	-	0.060	-

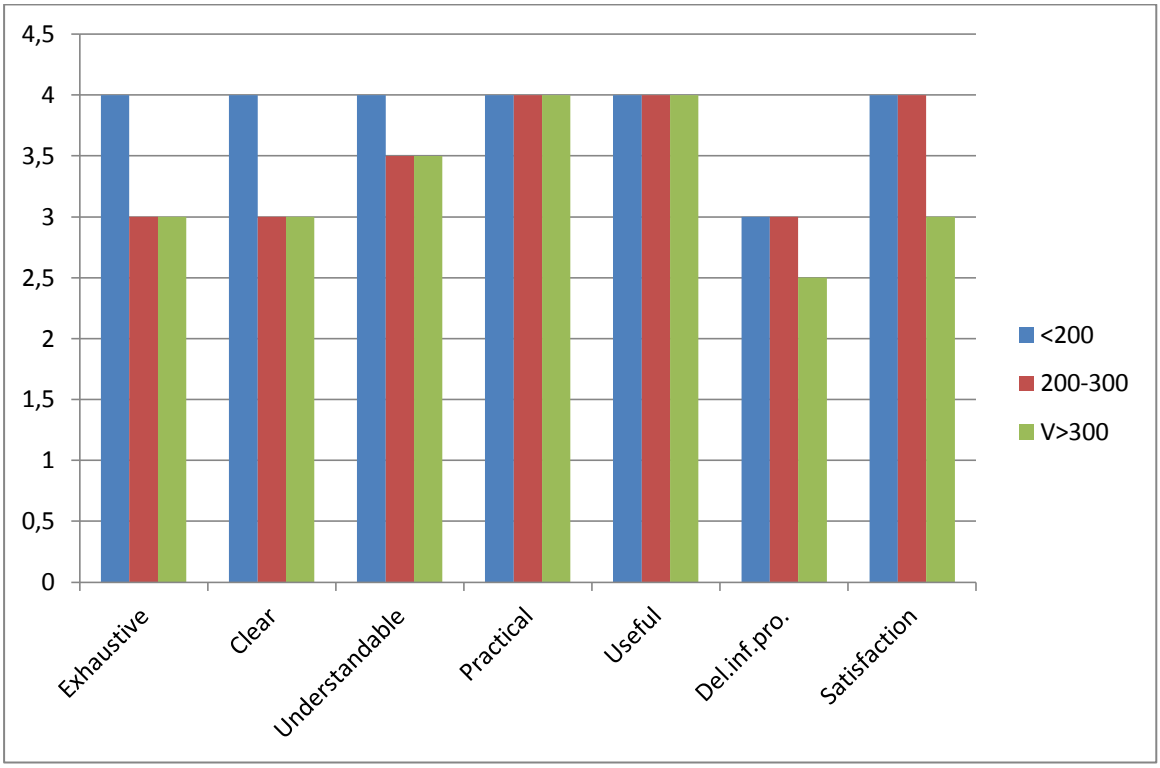
– : not significant

Table 12: Your vet: how much he/she has the following skills?

Question	Size	Milk Yield	SCC
Exhaustive	-[1]	-	0.099
Clear	-	-	-
Understandable	-	-	-
Practical	-	-	-
Useful	-	0,093	0.060
Delivers information spontaneously, proactively	-	-	-
Overall, how much are you satisfied with your vet communication?	-	-	-

– : not significant

Fig. 1: Distribution of Vet scores medians by herd bulk milk SCC



Famers opinion on Veterinarian and non-veterinarian consultant, such as nutritionist or agronomist, showed statistically significant differences when two skills, “practical” and “useful” were considered and for overall and farmers’ satisfaction (Table 13). Veterinarians are statistically more appreciated being more “practical” and “useful”, and farmers are more satisfied by them than by non-vet consultants. Indeed, in this latter case veterinarians have 57% of score 4 and 5, while non-vets have 36%. However, score 5 is infrequent both for vets and non-vets, highlighting that the ideal satisfaction level is not achieved. The BTM SCC is a factor conditioning every answers except ”practical” and “overall satisfaction” (Table 14, Fig.1), with values in favor of the vet. Non-vet consultants’ scores decrease when BTM SCC increases, while vets’ scores were always high. This shows that non-vet consultants are blamed more than vets, when milk quality decreases.

Table 13. Statistical comparison of scores recorded for the questions: "how much important are the following skills" for vet and non-vet practitioners

Question	Strata	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Exhaustive	Vet	-[1]	3.00	3.43	0.88	1.3	12.0	40.0	36.0	10.7
	Non-vet		3.00	3.39	1.03	5.4	10.8	36.5	33.8	13.5
Clear	Vet	-	4.00	3.63	0.87	1.4	4.1	42.5	34.2	17.8
	Non-vet		3.00	3.45	1.00	5.4	6.8	40.5	32.4	14.9
Understandable	Vet	-	4.00	3.59	1.03	2.7	10.7	33.3	32.0	21.3
	Non-vet		4.00	3.43	1.03	5.4	10.8	32.4	37.8	13.5
Practical	Vet	0.003	4.00	3.8	0.99	2.7	6.8	24.3	40.5	25.7
	Non-vet		3.00	3.26	1.13	6.8	18.9	31.1	28.4	14.9
Useful	Vet	0.001	4.00	3.82	0.90	1.3	5.3	27.6	42.1	23.7
	Non-vet		3.00	3.21	1.11	7.0	19.7	29.6	32.4	11.3
Del.inf.proact.	Vet	-	3.00	2.99	1.14	11.8	21.1	31.6	27.6	7.9
	Non-vet		3.00	3.07	1.13	12.0	14.7	37.3	26.7	9.3
Satisfaction	Vet	0.019	4.00	3.56	0.99	2.7	12.0	28.0	41.3	16.0
	Non-vet		3.00	3.17	1.06	8.0	13.3	42.7	25.3	10.7

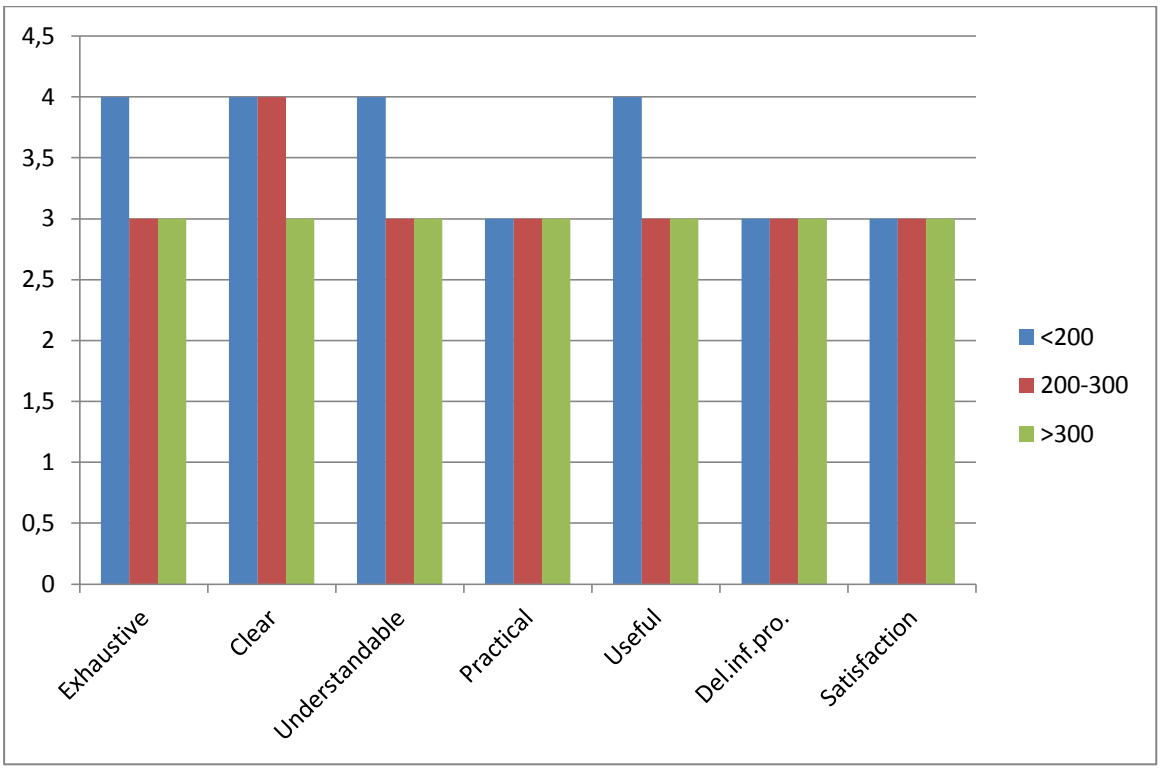
– : not significant

Table 14. Your non-vet practitioners (nutritionist, agronomist): how much they have the following skills?

Question	Size	Milk Yield	SCC
Exhaustive	-[1]	-	0.047
Clear	-	0,087	0.010
Understandable	-	-	0.050
Practical	-	-	-
Useful	0.060	-	0.035
Delivers information spontaneously, proactively	-	0,028	0.032
Overall, how much are you satisfied with your non-vet practitioners communication?	-	-	-

– : not significant

Fig. 2: Distribution of Non Vet scores medians by herd bulk milk SCC



Every comparison between veterinarian and salesmen of pharmaceutical companies are statistically significant (Table 15). Pharma-salesmen showed score 5 very seldom and, overall, they have scores 4 and 5 in less than 10% of the answers. High satisfaction level (scores 4-5) for vets is 57% while about pharma-salesmen is 8.6%. Scores 1 and 2 scores are much more frequent for pharma-salesmen, about 50% of the total, than for vets. The classification of pharma-salesmen results by farm characteristics showed no statistical effects (Table 16).

Table 15. Statistical comparison of scores recorded for the questions: "how much important are the following skills" for vet and salesmen from pharmaceutical companies

Question	Strata	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Exhaustive	Vet	0.000	3.00	3.43	0.88	1.3	12.0	40.0	36.0	10.7
	Pharma		3.00	2.33	0.912	24.3	24.3	45.7	5.7	-
Clear	Vet	0.000	4.00	3.63	0.87	1.4	4.1	42.5	34.2	17.8
	Pharma		2.50	2.33	0.96	25.7	24.3	41.4	8.6	-
Understandable	Vet	0.000	4.00	3.59	1.03	2.7	10.7	33.3	32.0	21.3
	Pharma		3.00	2.47	1.06	24.3	20	42.9	10	2.9
Practical	Vet	0.000	4.00	3.8	0.99	2.7	6.8	24.3	40.5	25.7
	Pharma		2.00	2.26	1.06	31.4	22.9	37.1	5.7	2.9
Useful	Vet	0.000	4.00	3.82	0.90	1.3	5.3	27.6	42.1	23.7
	Pharma		2.00	2.24	0.94	25.7	32.9	32.9	8.6	-
Del.inf.proact.	Vet	0.007	3.00	2.99	1.14	11.8	21.1	31.6	27.6	7.9
	Pharma		3.00	2.47	1.11	25.7	20	40	10	4.3
Satisfaction	Vet	0.000	4.00	3.56	0.99	2.7	12.0	28.0	41.3	16.0
	Pharma		2.00	2.21	0.93	25.7	35.7	30	8.6	-

– : not significant

Table 16. Your salesmen from pharmaceutical companies: how much they have the following skills?

Question	Size	Milk Yield	SCC
Exhaustive	-[1]	-	-
Clear	-	-	-
Understandable	-	-	-
Practical	-	-	-
Useful	-	-	-
Delivers information spontaneously, proactively	-	-	-
Overall, how much are you satisfied with your salesmen from pharmaceutical companies communication?	-	-	-

– : not significant

Salesmen from feeding companies have frequencies of scores 4 and 5 higher than pharma-salesmen. This was confirmed by satisfaction score which, in feeding salesmen, was 22% vs. 8.6% of pharma-salesman (Table 17). Every comparison between vet and feeding salesmen is statistically significant

except the one on proactive skill. Vet showed frequencies of scores 4 and 5 higher than feeding salesmen. Also in this case, as observed for non-vet consultants, BTM SCC has influence on score (Table 18, Fig.3). Indeed, feeding salesmen scores decrease suddenly when BTM SCC goes from <200.000 to 200-300.000 cells/ml. This trend is confirmed also in farms where BTM SCC is >300.000 cells/ml. in this latter case, also scores 4 and 5 decrease also for vets, even if the change is less marked.

Table 17. Statistical comparison of scores recorded for the questions: "how much important are the following skills" for vet and salesmen from feeding companies

Question	Strata	P=	Median	Mean	Std.Dev.	Score Frequencies				
						1	2	3	4	5
Exhaustive	Vet	0.000	3.00	3.43	0.88	1.3	12.0	40.0	36.0	10.7
	Feed		3.00	2.81	1.04	10.8	24.3	45.9	10.8	8.1
Clear	Vet	0.000	4.00	3.63	0.87	1.4	4.1	42.5	34.2	17.8
	Feed		3.00	2.92	1.05	9.3	22.7	42.7	17.3	8.0
Understandable	Vet	0.001	4.00	3.59	1.03	2.7	10.7	33.3	32.0	21.3
	Feed		3.00	3.01	1.02	9.2	15.8	47.4	19.7	7.9
Practical	Vet	0.000	4.00	3.8	0.99	2.7	6.8	24.3	40.5	25.7
	Feed		3.00	3.04	1.06	7.9	21.1	39.5	22.4	9.2
Useful	Vet	0.000	4.00	3.82	0.90	1.3	5.3	27.6	42.1	23.7
	Feed		3.00	2.87	1.16	14.5	22.4	32.9	22.4	7.9
Del.inf.proact.	Vet	-	3.00	2.99	1.14	11.8	21.1	31.6	27.6	7.9
	Feed		3.00	2.99	1.06	9.2	19.7	43.4	18.4	9.2
Satisfaction	Vet	0.000	4.00	3.56	0.99	2.7	12.0	28.0	41.3	16.0
	Feed		3.00	2.92	1.05	10.5	18.4	48.7	13.2	9.2

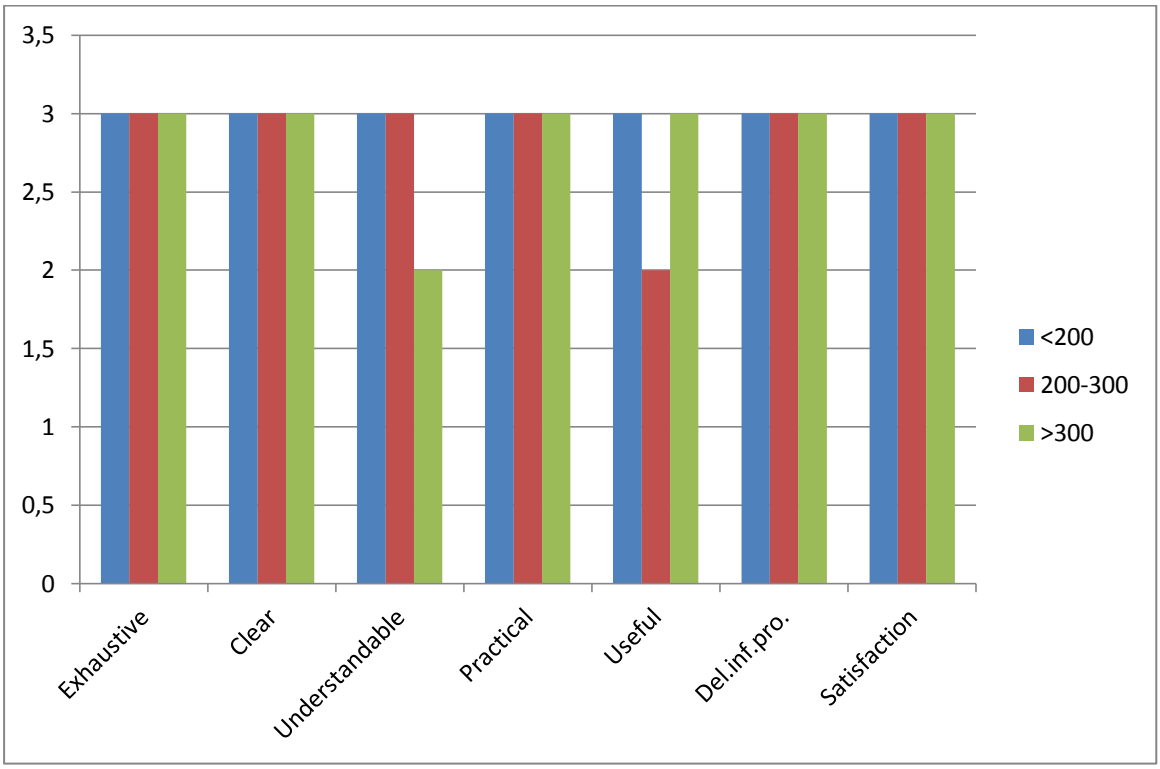
[1] – : not significant

Table 18. Your salesmen from feeding companies: how much they have the following skills?

Question	Size	Milk Yield	SCC
Exhaustive	0.068	-[1]	-
Clear	-	-	0.012
Understandable	-	-	0.003
Practical	-	-	0.010
Useful	-	-	0.003
Delivers information spontaneously, proactively	-	-	0.029
Overall, how much are you satisfied with your salesmen from feeding companies communication?	-	-	0.004

[1] – : not significant

Fig. 3: Distribution of salesmen from feeding companies scores by herd bulk milk SCC



5. DISCUSSION

Study A

The unexpected high frequency of participants considering pet as a family member shows the increased importance of pets for their owners also in a country like Italy. Accordingly to this evidence, veterinarians should consider the consequent role of communication and uncertainty of receiver response, even if they practice within a community or in an area where apparently pets are not considered very important.

In our study, pet is considered a family member in the large majority of cases, a finding that is in accordance with other European studies [86]. Moreover, pet owners often consider it even more than just a member: it is the one they have a special relationship with.

Results show, as expected, that people considering the pet as a family member are very demanding with their veterinarian. Indeed, the increase of importance of pet parallels the increase in demands and expectations, as suggested by previous studies [87]. For instance, if the pet is considered as a family member, the client is more demanding on the place where bad news is delivered. Conversely, our study showed several evidences, even if not always significant, that who considers pet just an animal is less demanding compared to individuals who consider it as a family member. For example, all the people considering the pet just an animal are satisfied with usual communication and with the way bad news was delivered; likewise, they consider adequate the place where bad news was delivered. Moreover, all subjects considering the pet just an animal were persuaded that veterinarian tried to explain every therapeutical option, in order to make the client understand what was possible and let him/her make the best choice.

Results suggest that participants considering the pet as a family member are inclined to be more suspicious about veterinarian; however, significant difference was not observed. The veterinarian was exhaustive for 100% of people considering the pet just an animal, conversely people considering the pet as a family member, in some cases, thought that he/she could have done more.

This study allows also to describe an initial profile of the most demanding client, highlighting predictors of attachment to the pet. For example, the importance of pet increases when the number of family members decreases and when pet owner's gender is female, accordingly with results of previous studies [76]. Moreover, pet is considered more frequently as a family member when three or more species are present in the same household. This, even though not statistically significant, could be explained by a peculiar attitude of people loving animals. Furthermore, people with more animals have more chance to have bad news experience, and this could explain the increased number of owners of two or more different species in the bad news sample.

Bad news is bad independently of veterinarian behavior, because it is related to the bond between the owner and the pet. This is supported by the results on the relationship between bad news experience and veterinarian role, which showed to be not significant, suggesting that client emotions were mainly influenced by his/her relationship with own pet.

This emotional aspect should be considered by the veterinarian, as it is well documented that a lack of awareness may affect the communication approach with the owner and it has the potential to increase pet owner grief [81, 83]. Therefore, the importance of communication depends on how pet is considered by its owner and, than, it is closely related to human-animal bond phenomenon.

In our knowledge, this is the first studied performed addressing the veterinary communication and specifically BBN in Italy. Due to peculiar aspects of this country, the data supplied could be useful to understand client-practitioner communication and bad news delivering where veterinarians aren't specifically trained or pets usually are considered not important. The pattern described could be used as a reference for countries with similar societal attitude and cultural environment. Moreover, results from Italy allow to better describe the European attitude toward pets, being complementary with previous results from North Europe.

Independently of the location, practical application of this study results will allow to improve veterinary practice and also increase client comfort, satisfaction and well being. Indeed, recognizing the role of communication in veterinary medicine is important for public health. Moreover, it will

reduce veterinarian discomfort and improves satisfaction with companion animal visits, which was associated with various elements, including client-veterinarian communication. [73] Indeed, there are evidences that the acknowledgment of pets as family member leads to an increased expectation for the best medical care available.

Veterinary practitioners should consider that they are not managing an animal, but a family member having a demanding human relative who could be affected by veterinary practice, and this is a relevant aspect of public health. Moreover, the study suggests that in companion animal clinic there is not just an animal to treat, but an union human-animal demanding specific communication skills.

Results confirm that communication takes a leading role in veterinary medicine as well as in human medicine, and a client-centered approach should be adopted [88]. Moreover, communication skills should become important aspect of clinical practice and veterinary competences, and should be included in veterinary schools' programs.

Last, but not least, results of our study suggest that the importance of emotional bond with an animal should never be underestimated, even if societal attitudes and cultural contest seems to attribute a low consideration to animals. Moreover, the final objective of veterinary medicine is public health, which concerns all the aspects of human health, including mental health and emotional aspects, via the human-animal bond phenomenon [57], as highlighted also by One Health perspective [89]. Therefore, communication in veterinary clinical practice is important not only for clinical practice but also for public health.

Study B

The results of this study on communication in dairy herd management evidenced some interesting results. Indeed, farmers showed more interest in nutritional and management aspects than in problems related to infectious diseases (IBR, BVD) or animal welfare (milking, lameness), even if these problems are present in many dairy herds and are relatively easy to solve. This suggests that problem perception by the farmers is driven more by day-to-day problems than by a rational and efficient health management planning. This farmers' attitude could represent a problem in a public health perspective.

Another intriguing result is the higher interest in receiving information from study groups or from colleagues, less from magazines and even less from the web. This result is supported by the positive correlation between decrease of milk quality (increase in BTM SCC) and decreased trust in vets and other advisors. The parallel increase of trust in "other farmers" as a source of information suggest that there is a large gap in professional advisors capability to deliver technical information and, more important, on build up trust on his/her professional work.

These latter aspects were explored with questions concerning specifically communication with consultants. The data collected showed as vets are the most trustful advisor, even if the overall level of satisfaction is far from the ideal one. Salesman, both from pharma and feed companies, showed the lowest score and, thus, the lowest level of trust.

Among the factors which could have an influence on communication between farmer and advisor, only BTM SCC (milk quality) showed to have a consistent and significant effect. Indeed, the increase of BTM SCC was correlated in most of the case with a decrease of scores for all the consultants out of vets. In this latter case the decrease was generally observed only for herds with the poorest milk quality. This result sounds like as positive outcome for vets, but, in practice, it is the opposite. Indeed, the fact that other advisors were blamed (lower scores) for decrease in milk quality means that farmers believe they can do something, while vets were not affected because they are not considered to be involved in the problem. However, BTM SCC are the expression of an inflammatory

process (mastitis) and, therefore, a health problem that should be addressed and solved only by the vet.

These results confirm a peculiarity of Italian dairy scenario where vets are much less involved and much less listened by farmers for what concerns milk quality and mastitis management, than in other countries. This represent a specific problem in terms of animal health and food safety. Indeed, the minor role played by vets in managing the milk quality and mastitis problems at herd level lead to an underestimation of hazards and risks related to milk production and therefore to an increased risk for human health.

Improving vet communication skills could help to overcome this problem, through increasing the capability of vets to deliver practical and efficacious information and identifying the factors that could attract farmers interests.

5.1 One World - One Health - One Medicine: One Communication

This study confirmed the outcomes from previous surveys and showed the importance of communication in veterinary medicine in improving human health.

Overall, 78,8% of participants in Study A consider the pet as family member, highlighting that the importance of animals for human health is not related just to zoonoses. This strong emotional aspect is an unexpected outcome, and it suggests to veterinarians to take in account that they are managing a family member having a human relative that could be affected by veterinary practice. Therefore, in companion animal practice there is not just an animal to treat, but a demanding human-animal union, and this is a relevant aspect of public health requiring specific communication skills.

Also in the area of food producing animals, communication has a big potential. Indeed, our study showed a gap in veterinary practice, being unable to meet farmers' needs. An effective farmer-veterinarian communication is essential to improve farm management, herd health, food safety and also herd sustainability.

Communication in veterinary medicine is not less important for human health, and is not different from what is usually considered health communication. In public health there is not a clear border between human and animal health, as demonstrated by the One Health approach. Likewise, it is not possible to differentiate health communication from veterinary health communication. Indeed, both of them cover the same issue (zoonoses, food safety etc.) and use the same strategies. For example, pet care resemble human medicine patterns and if pets are considered as family members by owners, then pediatric clinical practice may be useful to investigate and to improve client-veterinarian interaction. Similarly, it is impossible to differentiate between risk communication in human and veterinary areas, having the same target, using the same strategies and often considering the same risks.

Communication in veterinary medicine aims to improve human health, as it does in other field.

Therefore, a “One Communication” approach appear to be the most helpful tool in improving human health in the One World-One Health-One Medicine.

6. REFERENCES

1. Harvard School of Public Health, *The Field of Health Communication*, Accessed: 13 Dec. 2013, Available from: http://www.hsph.harvard.edu/health-communication/;

2. National Cancer Institute, Public Health Service, National Institutes of Health, *Making Health Communication Programs Work (Pink Book)*, U.S. Department of Health & Human Services, 2002;

3. *Public Health Communication - Evidence for Behavior Change*, ed. R.C. Hornik, Routledge, 2002;

4. Wickremasinghe, D., *What makes for good health communication?*, in *Global health communication - Global Health Histories*, WHO, 2013;

5. Rajiv N. Rimal, Maria K. Lapinski, *Why health communication is important in public health* Bulletin of the World Health Organization, 2009, 87;

6. WHO, *Special theme issue: public health communication*, Bulletin of the World Health Organization 2009, 87, 565-644;

7. WHO, *Afghanistan Report - Health communication*, 2003, 19;

8. Obregón R., Chitnis K., Morry C., Feek W., Bates J., Galway M., Ogden E., *Achieving polio eradication: a review of health communication evidence and lessons learned in India and Pakistan*, Bulletin of the World Health Organization 2009;

9. WHO, *Create HPV vaccination communication strategies*, Accessed: 13 Dec. 2013, Available from: http://www.who.int/immunization/hpv/communicate/en/;

10. WHO, *HPV Vaccine Communication - Special considerations for a unique vaccine* Geneve, WHO, 2013;

11. Parks W., Lloyd L., *Planning social mobilization and communication for Dengue fever prevention and control*, Geneve, WHO, 2004;

12. WHO, *Effective Media Communication during Public Health Emergencies*, Geneve, WHO, 2005;

13. Wiysonge C., Waggie Z., Rhoda L., Hussey G., *Improving communication for immunisation in Africa: contribution of the Vaccines for Africa website* The Pan Africa Medical Journal, 2009, 2(2);

14. Waisbord S., Larson H. J., *Why Invest in Communication for Immunization? Evidence and Lessons Learned. A joint publication of the Health Communication Partnership based at Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs (Baltimore) and the United Nations Children's Fund (New York)*, 2005;

15. O'Sullivan G.A., Yonkler J.A., Morgan W., Merritt A.P., *A Field Guide to Designing a Health Communication Strategy*, Baltimore, MD, Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs, 2003;

16. United Nations Children's Fund Regional Office for South Asia, *Strategic communication for behaviour and social change in South Asia*, UNICEF, 2005;

17. Wittet, S., *Hepatitis B vaccine introduction - Lessons learned in advocacy, communication and training* PATH, 2001;

18. WHO, UNICEF, FAO, *Communication for behavioural impact - A toolkit for behavioural and social communication in outbreak response*, WHO, 2012;

19. Feig, C., *WHO: Communicating for Health*, in *Global health communication - Global Health Histories*, WHO, 2013;

20. Zaman F., Underwood C., *The Gender Guide for Health Communication Programmes*, Baltimore, Johns Hopkins Bloomberg School of Public Health / Center for Communication Programs, 2003;

21. *A Quick Guide to Health Literacy: Fact Sheets, Strategies, Resources*, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2005;

22. *Radio Broadcasting for Health - a decision makers guide*, Information and Communication for Development, UK Department for International Development 2004;

23. CDC, *Gateway to Health Communication & Social Marketing Practice*, 2013 Accessed: 13 Dec. 2013, Available from: http://www.cdc.gov/healthcommunication/about.html;

24. Services, U.S. Department of Health and Human, *Health Communication, Health Literacy, and e-Health*, Accessed: 13 Dec. 2013, Available from: http://www.health.gov/communication/Default.asp;

25. Barnett, M. and M. J. Mannis, *Contact Lenses in the Management of Keratoconus* Cornea, 2011, 30(12): p. 1510-1516;

26. WHO, *World Health Organization Outbreak Communication Planning Guide*, WHO, 2008;

27. *Health Promotion Theory*, 2nd ed, ed. M.D. L. Cragg, W. Macdowall, Maidehead, UK, OUP, McGraw-Hill Education, 2013;

28. Schwabe C.W., *Veterinary Medicine and Human Health*, 3rd ed, Baltimore, London, Williams & Wilkins, 1984;

29. One Health Initiative, *About the One Health Initiative* Accessed: 13 Dec. 2013, Available from: http://www.onehealthinitiative.com/about.php;

30. Kahn, L. H., *'One Medicine - One Health' interview with Ronald M. Davis, MD, President of the American Medical Association, 14 May 2008* Vet Ital, 2009, 45(1): p. 19-21;

31. Rabinowitz P., Scotch M., Conti L., *Human and animal sentinels for shared health risks* Vet Ital, 2009, 45(1): p. 23-4;

32. Beasley V., *One Toxicology, Ecosystem Health and One Health* Veterinaria Italiana, 2009, 45(1): p. 97-110;

33. Thamm D., Dow S., *How companion animals contribute to the fight against cancer in humans* Veterinaria Italiana, 2009, 45(1): p. 111-120;

34. Zinsstag J., Schelling E., Bonfoh B., Fooks A. R., Kasymbekov J., Toews D. W., Tanner M., *Towards a One Health research and application tool box* Veterinaria Italiana, 2009, 45(1): p. 121-133;

35. Gibbs E.P., Anderson T.C., *One World - One Health' and the global challenge of epidemic diseases of viral aetiology* Vet Ital, 2009, 45(1): p. 35-44;

36. FAO, *FAO's support to the One Health regional approach - Towards integrated and effective animal health – food safety surveillance capacity development in Eastern Africa*, FAO, 2013;

37. Fletcher J., Franz D., LeClerc E., *Healthy plants: necessary for a balanced One Health concept* Veterinaria Italiana, 2009, 45(1): p. 79-95;

38. Barnett, M. L., et al., *Mapping Physician Networks with Self-Reported and Administrative Data* Health Services Research, 2011, 46(5): p. 1592-1609;

39. OIE, *One Health at a glance*, Accessed: 13 Dec. 2013, Available from: http://www.oie.int/for-the-media/onehealth/;

40. CDC, *One Health*, Accessed: 13 Dec. 2013, Available from: http://www.cdc.gov/onehealth/;

41. Kumar, S., et al., *An Assessment of U(VI) removal from groundwater using biochar produced from hydrothermal carbonization* Journal of Environmental Management, 2011, 92(10): p. 2504-2512;

42. OIE, *One Health*, Accessed: 13 Dec. 2013, Available from: http://www.oie.int/for-the-media/onehealth/oie-involvement/;

43. FAO, *One Health: Food and Agriculture Organization of the United Nations Strategic Action Plan*, 2011;

44. FAO, OIE, WHO, UN System Influenza Coordination, UNICEF, The World Bank, *Contributing to One World, One Health - A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface*, 2008;

45. *FAO workshop leverages country case studies for stronger collaboration on One Health*, 2013 Accessed: 13 Dec. 2013, Available from: http://www.fao.org/ag/againfo/programmes/en/empres/news_041013.html;

46. Bonizzi L., Cipolla M., Grieco V., Grilli G, Lanfranchi P., Mortarino M., Zecconi A. , *Piano Regionale della Prevenzione Veterinaria 2012-2014*, Milano, Regione Lombardia, 2011;

47. EFSA, *Risk communication: Making it clear, timely and relevant*, Accessed: 13 Dec. 2013, Available from: http://www.efsa.europa.eu/en/press/news/120711e.htm;

48. EFSA, *Risk communication*, Accessed: 13 Dec. 2013, Available from: http://www.efsa.europa.eu/en/efsawhat/riskcommunication.htm?wtrl=01;

49. Barnett, M. H., G. Chohan, and L. Davies, *Practical neurology-1 Blurred vision and pain in the eye* Medical Journal of Australia, 2011, 195(6): p. 329-332;

50. ECDC, *European Antibiotics Awareness Day*, Accessed: 13 Dec. 2013, Available from: http://ecdc.europa.eu/en/eaad/Pages/Home.aspx;

51. ECDC, *Antimicrobial resistance* Accessed: 13 Dec. 2013, Available from: http://www.ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/Pages/index.aspx;

52. CDC, *Get Smart About Antibiotics Week*, Accessed: 13 Dec. 2013, Available from: http://www.cdc.gov/getsmart/campaign-materials/week/index.html;

53. Shaw J. R., Bonnett B. N., Roter D. L., Adams C. L., Larson S.,, *Gender differences in veterinarian-client-patient communication in companion animal practice* J Am Vet Med Assoc, 2012, 241(1): p. 81-8;

54. MedicineWise, NPS, *Join the fight against antibiotic resistance*, Accessed: 13 Dec. 2013, Available from: http://www.nps.org.au/about-us/what-we-do/campaigns-events/antibiotic-resistance-fighter;

55. WHO, *Antimicrobial resistance*, Accessed: 13 Dec. 2013, Available from: http://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance;

56. WHO Regional Office for Europe, *Tackling antibiotic resistance from a food safety perspective in Europe*, Copenhagen, WHO Regional Office for Europe, 2011;

57. Lagoni L., Hetts S., Butler C., *The human-animal bond and grief*, Philadelphia, Saunders, 1994;

58. Grant C.H.3rd, Cissna K.N., Rosenfeld L.B.,, *Patients' perceptions of physicians communication and outcomes of the accrual to trial process* Health Commun, 2000, 12(1): p. 23-39;

59. Kanji N., Coe J.B., Adams C.L., Shaw J.R., *Effect of veterinarian-client-patient interactions on client adherence to dentistry and surgery recommendations in companion-animal practice* Journal of the American Veterinary Medical Association, 2012, 240(4): p. 427-36;

60. Shaw J.R., Adams C.L., Bonnett B.N., *What can veterinarians learn from studies of physician-patient communication about veterinarian-client-patient communication?* Journal of the American Veterinary Medical Association, 2004, 224(5): p. 676-84;

61. Coe J.B., Adams C.L., Bonnett B.N., *A focus group study of veterinarians' and pet owners' perceptions of veterinarian-client communication in companion animal practice* Journal of the American Veterinary Medical Association, 2008, 233(7): p. 1072-80;

62. Chadderdon L.M., King L.J., Lloyd J.W., *The skills, knowledge, aptitudes, and attitudes of successful veterinarians: a summary of presentations to the NCVEI subgroup (Brook Lodge, Augusta, Michigan, December 4-6, 2000)* Journal of Veterinary Medical Education, 2001, 28(1): p. 28-30;

63. Adams C.L., Kurtz S.M., *Building on existing models from human medical education to develop a communication curriculum in veterinary medicine* Journal of Veterinary Medical Education, 2006, 33(1): p. 28-37;

64. Latham C.E., Morris A., *Effects of formal training in communication skills on the ability of veterinary students to communicate with clients* Veterinary Record, 2007, 160(6): p. 181-6;

65. Kurtz S.M., *Teaching And Learning Communication Skills In Medicine*, 2nd ed, Radcliffe Publishing, 2005;

66. Jansen J., Lam T.J., *The role of communication in improving udder health* Vet Clin North Am Food Anim Pract, 2012, 28(2): p. 363-79;

67. Jansen J., Renes R.J., Lam T.J., *Evaluation of two communication strategies to improve udder health management* J Dairy Sci, 2010, 93(2): p. 604-12;

68. Jansen J., Steuten C.D., Renes R.J., Aarts N., Lam T.J., *Debunking the myth of the hard-to-reach farmer: effective communication on udder health* J Dairy Sci, 2010, 93(3): p. 1296-306;

69. Kleen J.L., Atkinson O., Noordhuizen J.P., *Communication in production animal medicine: modelling a complex interaction with the example of dairy herd health medicine* Ir Vet J, 2011, 64(1): p. 8;

70. Kristensen E., Jakobsen E.B., *Danish dairy farmers' perception of biosecurity* Prev Vet Med, 2011, 99(2-4): p. 122-9;

71. Kristensen E., Jakobsen E.B., *Challenging the myth of the irrational dairy farmer; understanding decision-making related to herd health* N Z Vet J, 2011, 59(1): p. 1-7;

72. Lam T.J., Jansen J., van den Borne B.H., Renes R.J., Hogeveen H., *What veterinarians need to know about communication to optimise their role as advisors on udder health in dairy herds* N Z Vet J, 2011, 59(1): p. 8-15;

73. Shaw J.R., Adams C.L., Bonnett B.N., Larson S., Roter D.L., *Veterinarian satisfaction with companion animal visits* Journal of the American Veterinary Medical Association, 2012, 240(7): p. 832-41;

74. Martin F., Ruby K.L., Deking T.M., Taunton A.E., *Factors associated with client, staff, and student satisfaction regarding small animal euthanasia procedures at a veterinary teaching hospital* J Am Vet Med Assoc, 2004, 224(11): p. 1774-9;

75. Beckman H.B., Markakis K.M., Suchman A.L., Frankel R.M., *The doctor-patient relationship and malpractice. Lessons from plaintiff depositions* Archives of Internal Medicine 1994, 154(12): p. 1365-70;

76. Adams C.L., Bonnett B.N., Meek A.H., *Predictors of owner response to companion animal death in 177 clients from 14 practices in Ontario* Journal of the American Veterinary Medical Association, 2000, 217(9): p. 1303-9;

77. Williams S., Mills J.N., *Understanding and responding to grief in companion animal practice* Australian Veterinary Practitioner, 2000, 30: p. 55-62;

78. Buckman R., *Breaking bad news: why is it still so difficult?* British medical journal, 1984, 288: p. 1597-1599;

79. Bor R., Miller R., Goldman E., Scher I., *The meaning of bad news in HIV disease* Counsel Psychological Quarterly, 1993, 6: p. 69-80;

80. Manette C.S., *A reflection on the ways veterinarians cope with the death, euthanasia, and slaughter of animals* Journal of the American Veterinary Medical Association, 2004, 225(1): p. 34-8;

81. Buckman R., Kason Y., *How to break bad news: a guide for health care professionals*, Baltimore, Johns Hopkins University Press, 1992;

82. Eggly S., Tzelepis A., *Relational control in difficult physician-patient encounters: negotiating treatment for pain* J Health Commun, 2001, 6(4): p. 323-33;

83. Lagoni L., Durrance D., *Connecting with grieving clients: supportive communication for 14 common situations*, 2nd ed, Lakewood, Colo., American Animal Hospital Association Press, 2011;

84. Valeeva N.I., Lam T.J.G.M., Hogeveen H., *Motivation of dairy farmers to improve mastitis management* Journal of Dairy Science, 2007, 90(9): p. 4466-4477;

85. Jansen J., van den Borne B.H.P., Renes R.J., van Schaik G., Lam T.J.G.M., Leeuwis C., *Explaining mastitis incidence in Dutch dairy farming: The influence of farmers' attitudes and behaviour* Preventive Veterinary Medicine, 2009, 92(3): p. 210-223;

86. Lund H.S., Eggertsson S., Grondahl A.M., Eggertsdottir A.V., *Views on euthanasia and the rehoming of dogs in Norway and Iceland* Veterinary Record, 2010, 166(24): p. 749-752;

87. Lund H.S., Eggertsson S., Jorgensen H., Grondahl A.M., Eggertsdottir A.V., *Changes in the relationships between dogs, owners and veterinarians in Norway and Iceland* Veterinary Record, 2009, 165(4): p. 106-10;

88. Sparks L., Villagran M.M., Parker-Raley J., Cunningham C.B., *A patient-centered approach to breaking bad news: Communication guidelines for health care providers* Journal of Applied Communication Research, 2007, 35(2): p. 177-196;

89. One Health Initiative, *One Health Initiative - Mission statement*, Accessed: 13 Dec. 2013, Available from: http://www.onehealthinitiative.com/mission.php.