Antimicrobial Stewardship Programs: An Urgent Need Today for Safer Tomorrow

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Antibiotics have been extensively used in the healthcare system despite the fact that their use is directly associated with bacterial resistance. Several studies not only described the beneficial part of using antibiotics, but also stated the negative consequences of their usage. Colgan and Powers (2001) stated that despite the fact that antibiotics have been extensively beneficial in fighting infections, their use has also given rise to the antibiotic resistance phenomenon since they also affect the bacteria that are considered as part of our own flora. **The longer the duration that antibiotics have been used, the more chance you give to colonizers or your own normal flora to develop resistance towards this antibiotic.** An observational study done in the United States revealed 48% growth in antibiotic use between the year 1980 and 1992. This use had a lot of negative consequences starting from a mild side effect to major complications like having Clostridium difficile and anaphylaxis. Consequently, this led to increased length of stay in hospitals, increased medical services costs, increased antibiotic use, and increased mortalities (Steinman et al., 2009).

Many investigators discussed the different adverse outcome associated with the use/abuse of antibiotics among patients; some of them described adverse drug reactions in relation to antibiotic use in hospitalized patients (Budnitz et al., 2002), emergency departments visits, and in the community. These reactions included in some cases leucopenia, diarrhea and neurotoxicity when prescribed trimethoprim/sulfamethozale, ceftriaxone, and isoniazid respectively. Another study by Shehab and colleagues done in the United States revealed that 19% of emergency department visits were related to adverse drug event due to antimicrobial use, where the majority of them were allergic reaction (Shehab et al., 2008). On top, the inappropriateness of antibiotic use can mainly lead to the emergence of antimicrobial-resistant organisms, which in turn makes it harder for physicians to eliminate infections from the body as a result of bacterial ability to survive in the presence of antimicrobials. In addition, patients infected with these superbugs or 'multidrug resistant pathogens' had extended hospital length of stay, medical cost increase and sometimes these infections lead to mortalities. In addition to this, antimicrobial use has been linked with nosocomial infections with multidrug resistant pathogens in intensive care units as stated earlier (Richards et al., 2000; Rosenthal et al., 2006). In addition to the aforementioned adverse effects on health, antibiotic resistance caused by the antibiotic abuse contributes to the high economic costs in the society. **In the States, the antibiotic resistance costs between $ 500 million and $ 30 billion each year, a very high cost when compared to the amount put for treating susceptible infections.** Thus, the economics is another significant aspect of this problem that is taken into consideration worldwide. (Erlandsson et al., 2007)

In view of the fact that antimicrobial resistance is an emerging threatening problem to the public, several potential strategies to reduce the antibiotic use/abuse have been discussed (Hemo et al., 2009). Antimicrobials are frequently prescribed for viral illnesses and physicans might prescribe more antibiotics based on the patients' demand and/or satisfaction. This has been sometimes attributed to the low level of education being given to patients at the time of their consultation. One of the suggested strategies to reduce this antibiotic use was to increase the public awareness on the consequences of using antibiotics hazardly and to explain why antibiotic use should be limited.

While trying to achieve better prescribing practices, Belongia and Schwartz (1998) recommended first to have a better understanding of the associated factors that promote overuse and also an understanding of the possible ways to change these behaviors. This study described some of the main reasons for antibiotic abuse, these included lack of education, patient expectations, and economic cost. The investigators also suggested that the feedback to physicians on their prescribing habits along with peer education will also help to limit antibiotic overprescribing. Other investigators in a study done by Hickman, et al., (2003) described the effect of educational intervention programs on reducing the rate of inappropriate antibiotic use while treating acute bronchitis among adult and children population. Educational information sheets were distributed to physicians containing information about the consequences of inappropriate antibiotics treatment in bronchitis in addition to cough and cold package inserts and newsletters. The investigators have observed a 20% reduction in antibiotic use compared to a control group during a six-month time frame.

On the other hand, several studies focused on implementing different strategies to enhance antimicrobial stewardship in hospitals. Some of these interventions talked about formulary systems, antimicrobial cycling among infected patients, and computer-assisted programs. Furthermore, some other studies described interventional studies in pediatric intensive care units also (Toltzis et al., 1998; Moss et al., 2002; Mullet et al., 2001) which also included antibiotic cycling (Moss et al., 2002), antibiotic restriction policy, educational interventions (Ding et al., 2008), computer-assisted programs, formulary replacement (Lee et al., 1995), introduction of order forms (Gyssens et al., 1997), feedback activities (De Santis et al., 1994) and required approval from an infectious diseases physician for drug prescription (John et al., 1997). An interventional study done by Ding and colleagues described that applying an antibiotic stewardship program would decrease the abuse of antibiotics (Ding et al., 2008). In addition, the investigators followed their intervention by describing how some bacteria changed their resistance profile towards some antibiotics; incidence of P. aeruginosa resistant to imipenem, cefepime, and ceftazidime decreased ($P < 0.05$); and the incidence of E. coli and K. pneumoniae resistant to cefepime ($P < 0.01$) (Ding et al., 2008) . In addition, another study described the use of computer assisted technology in providing decision support for physicians prescribing antimicrobial agents. This system enabled physicians to retrieve patients' vital signs, laboratory test results, radiology test results, and pathology results. Investigators noted that the rate of incorrect antibiotic doses decreased by 59%, the rate of sub therapeutic (anti-infective therapy that fell below the minimum recommendation) risk days decreased by 36%, and the rate of excessive-doses (antiinfective therapy that excluded the maximum recommendation) risk days declined by 28% (Mullet et al., 2001).

In summary, the literature has identified several antimicrobial stewardship programs in the healthcare setting as well as in the community and most of them have succeeded in reducing the inappropriate antibiotic use.

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